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WILLIAM DE C. RAVENEL,
*Administrative Assistant to the Secretary,
United States National Museum.*

APRIL 25, 1924.

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By Earl V. Shannon

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STUDIES ON THE LARVAE OF NORTH AMERICAN BEETLES OF THE SUBFAMILY TENEBRIONINAE WITH A DESCRIPTION OF THE LARVA AND PUPA OF *MERINUS LAEVIS* (OLIVIER).

By R. A. ST. GEORGE,

Of the Bureau of Entomology, United States Department of Agriculture.

INTRODUCTION.

The present paper gives a revised systematic characterization of the larvae of the subfamily Tenebrioninae; discusses a suggested close relationship between the larvae of this subfamily and those of the Blaptinae; it enumerates and gives a detailed account of the larvae of the genera of Tenebrioninae which are present in the National Collection, it further discusses LeConte's old genus *Neatus*, and gives a generic key. In conclusion it has a general morphological description of the hitherto undescribed larva and pupa of *Merinus laevis*. (Olivier).

Family TENEBRIONIDAE.

The larvae of the family Tenebrionidae were characterized by Schiödte, 1879.¹

The characterization is still applicable, and comparatively few additions and changes in the original diagnosis are needed in spite of the great number of new larval types described since Schiödte's work was published.

The following family diagnosis is therefore to be considered as a mere translation of his Latin text with some of the original descriptive terms modified to suit the modern nomenclature and with a few new characters added and other slightly changed.²

FAMILY CHARACTERIZATION.

Tarsus and claw fused into a single, unguliform article. Legs short, fitted for digging and walking; coxae conical, inclinate, prothoracic coxae (normally) approximately contiguous. Head

¹ De metamorphosi Eleutheratorum Observationes Tenebriones Naturhist. Tidskr., ser. 3, vol. 10, pp. 479-508, pls. 5-12.

² Insertions into the original text are inclosed by parentheses.

nutant, no collum, foramen occipitale posterior. Second and third pairs of mouthparts retracted, with large, plicate, moderately convex maxillary articulating area. Clypeus distinctly separated. Labrum large, (nearly) covering the mandibles. Antenna inserted behind mandible, lateral, hardly longer than mandible, triarticulate; membrane connecting antenna with acetabulum protruding, joint-like. Mandible with molar part robust, cutting part bi-ortridentate, ventrally excavate. Maxilla covered by mandible; cardo large, triangular; stipes well developed, broad; cardo and stipes connected with submentum by maxillary articulating area; maxillary mala single, obtuse (or acute), pectinate; maxillary palpus not much longer than mala, triarticulate, with annular basal membrane. Labial palpus short, conical, biarticulate; stipites labii concrete. Mentum large, (normally) barrel-shaped, free; submentum large, trapezoidal, connected with maxillary articulating area. Gula simple, (normally) quadrangular. Ligula small (acute or obtusely pointed), bispinose (or multispinose). Abdomen prolonged, ninth segment terminal with pygidium extending over anal segment. Anal segment short, (sometimes) with two projecting and retractile ambulatory warts (verrucae). Spiracles annular, open, with a single respiratory slit.

Subfamily TENEBRIONINAE.

The family Tenebrionidae is divided by modern systematists into a great many subfamilies; Leng's catalogue of North American species records 22 subfamilies. Investigation of the larvæ seems to substantiate the correctness of this classification, which is based entirely on characters from the adults. However, the three main sections into which Schiödte divides the larvae can be considered only to a limited extent equivalent to three series of our subfamilies. Thus his first main section corresponds roughly to the subfamilies Scaurinae, Blaptinae, and Opatrinae; his third main section is equivalent to the subfamily Alleculinae; while his second main section represents at least five subfamilies. Among these is the subfamily Tenebrioninae (created by Gebien, 1910), with which the present paper is particularly concerned.

The Tenebrioninae are represented in Schiödte's work by only one genus, namely, *Tenebrio*, but in the National Collection there are some 13 genera referable to the subfamily and the representation in our collection of the other Tenebrionid subfamilies has increased proportionally. It is therefore obvious that Schiödte's group characterizations are no longer adequate, and in this paper the writer is attempting the needed recharacterization only of the subfamily Tenebrioninae. The other subfamilies, however, have been studied as far as available larval material permitted.

The morphological structures here examined are those which Schiödte discussed in his conspectus and upon the different development of which he formulated his diagnoses. It was due entirely to a lack of sufficient material when Schiödte's conspectus was formulated that it is now antiquated. His methods of research, however, and his sound judgment are still unsurpassed.

SUBFAMILY CHARACTERIZATION.

Mandible with the back opposite the cutting edge, without margination³ and excavated opposite the molar part; without membranous elevation³; apically bifid or trifid; with or without additional dorsal tooth between apex and molar part. Ocelli⁴ arranged in two transverse, crescent shaped or circular groups on each side of head, and with five more or less fused lenses; or with only ophthalmic spots which vary from being distinct to vanishing. Antenna⁴ with basal article distinctly longer than wide. Labrum dorsally without transverse, densely setose elevation. Leg with claw falcate, enlarged at base on exterior side. Pygidium apically bicornute, or without cerci and with side margins sharp and bearing short spine-like setae. Anal segment with or without projecting and retractile ambulatory warts (verrucae). Abdominal spiracles oval and transverse.

AFFINITIES BETWEEN THE SUBFAMILIES TENEBRIONINAE AND BLAPTINAE.

The value of the subfamily diagnosis of the Tenebrionidae as given above, depends more on the exact combination of the characters chosen than on a very special and exclusive development of the single characters; hence the diagnosis is formulated with rather liberal allowance for considerable variation in most of them. In this connection it is interesting to notice that through a series of genera these structures show a gradually increasing similarity to the corresponding structures in the genera *Blaps*, *Eleodes*, and *Embaphion*, which constitute an entirely different subfamily, namely, the Blaptinae.

In the genera *Xylopinus*, *Haplandrus*, *Polypleurus*, *Iphthimus*, *Alobates*, and *Glyptotus*, which represent the most typical forms of the subfamily Tenebrioninae, the left mandible has a trifid apex (a^1 , a^2 , a^3 , fig. 32) and an additional tooth (t) on the dorsal side near apex; the right mandible is also trifid (a^1 , a^2 , a^3 , fig. 33) but lacks the additional tooth (t) between the apex and molar part. In *Upis*,

³ Except *Rhinandrus* and *Zophobas*, which have slight marginations and membranous elevations.

⁴ In small immature larvæ the ocelli are more prominent and the proportions of antennal articles variable. In *Scotobates* the basal article is nearly as wide as long and the second article is long and globose.

Merinus, and *Scotobates* the mandible has changed slightly; both right and left mandibles are still apically trifid but both lack the additional dorsal tooth. (Figs. 2 and 5.) A still further modification of the mandible takes place in *Coelocnemis* and *Tenebrio*, which show the beginning of the mentioned affinity to the Blaptinae. In this subfamily the left mandible is bifid with a dorsal tooth near the molar part, and the right mandible is bifid with a dorsal tooth near apex. Moreover the back of the mandible has a slightly developed carinate edge opposite the cutting part, and opposite the molar part a well developed completely exposed membranous elevation with either a few rather strong setae arranged in groups anteriorly and posteriorly, or with many scattered, rather short and rigid setae. Compared with these structures in Blaptinae, we find in *Coelocnemis* each mandible bifid at apex, the left with an additional dorsal tooth near the molar part, the right with a tooth near apex (*t*, fig. 54). In this particular development, all species of *Tenebrio* are identical with *Coelocnemis*. In the latter genus (fig. 54) and the two species, *Tenebrio molitor* and *Tenebrio obscurus*, there is only one seta anteriorly and two setae posteriorly on the dorsal side of the back of the mandible (fig. 51) but in *Tenebrio picipes* (fig. 53) the setae are scattered and numerous as in some genera of the Blaptinae. Finally, the genera *Zophobas* and *Rhinandrus* demonstrate quite strongly the suggested affinity of the Tenebrioninae with Blaptinae, possessing in addition to the characters of *Coelocnemis*, *Tenebrio molitor*, and *Tenebrio obscurus*, a slight margin on the back opposite the cutting edge and also a membranous elevation opposite the molar part, two characters which do not occur in the other Tenebrioninae. In *Zophobas* the margin on the back of the mandible is rounded (*c*, fig. 62) while in *Rhinandrus* it is sharp (*c*, figs. 60 and 61) which is also typical of the Blaptinae (figs. 64 and 65, *Eleodes*). The setae on the anterior part of the membranous elevation are not as numerous in *Zophobas* and *Rhinandrus* as in the Blaptinae, but otherwise we find the whole structure developed exactly as in this subfamily.

In the typical Tenebrioninae the pygidium is bicornute at apex with side margins rounded, and either without setae, or with setae arranged in a transverse series in front of the cerci. (Figs. 36, 41, and 45.) In *Tenebrio molitor* and *Tenebrio obscurus* it is apically bicornute, but with side margins sharp and with two short, spinelike setae on each side near apex. (Figs. 49 and 50.) In *Tenebrio picipes* the apex is acute, not bicornute (fig. 52) and side margins are sharp but with many setae, bearing a striking resemblance to the pygidium of *Eleodes tricolorata*. (Fig. 63.) In *Zophobas* and *Rhinandrus* the pygidium is apically obtuse, without cerci and with side margins sharp and bearing two short spinelike setae on each side near apex.

(Figs. 56 and 57.) This form of pygidium shows a strong resemblance to that of *Eleodes opaca* (figs. 66 and 67) and *Eleodes carbonaria* (fig. 68).

In regards to the size of the anterior legs, as compared with that of the second and third pairs, the Tenebrioninae show considerable variation. In *Haplandrus*, *Scotobates*, and *Tenebrio* the first pair of legs are only slightly larger than the second and third pairs so that all legs appear to be nearly of the same size (figs. 47 and 48); but in *Polypleurus*, *Coelocnemis*, *Glyptotus*, *Xylopinus*, *Ipthimus*, *Upis*, *Merinus*, *Alobates*, *Zophobas*, and *Rhinandrus* the first pair of legs are strong and robust, and the second and third pairs rather suddenly decrease in size (figs. 17, 22, 34, 35). This difference is greatest in *Rhinandrus* (figs. 58 and 59), less in the other genera, increasing slightly according to the sequence in which they are mentioned. In this character *Zophobas* and *Rhinandrus* are close to the Blaptinae.

The ocelli also differ somewhat in arrangement and prominence within the subfamily. They are arranged in two transverse, crescent shaped or circular groups. In prominence they may vary from being distinct to vanishing or apparently wanting. The various ocelli on each side of the head may be represented in the ocellar groups either by lenses, more or less fused, or only by pigmented spots which may be either distinct or indistinct. In one Central American species⁵ in the national collection, apparently closely related to *Coelocnemis*, five distinct ocelli are present in two transverse groups and the lenses are separated and protruding. In *Upis* and *Merinus* the ocelli in each of the groups are without spaces between the lenses and less protruding. In *Scotobates*, *Ipthimus*, *Haplandrus*, *Glyptotus*, and *Tenebrio* the divisions between the lenses can not readily be seen and the latter are almost fused together, so that each group of ocelli appears more or less as a single large ocellus. This is particularly the case in *Tenebrio*, where the two ocellar groups appear as two single ocelli and are so described by Schiödt. In *Alobates*, *Coelocnemis*, *Rhinandrus*, and *Zophobas*, the ophthalmic spots vary from being present to vanishing. By considering the ocelli as two groups, even when each is fused into what appears to be a single ocellus, we can include all genera of the Tenebrioninae in our characterization. In the Blaptinae the ocelli are evanescent.

The abdominal spiracles are oval and transverse in all genera of both Tenebrioninae and Blaptinae.

⁵ Labeled: "Cacao, Trece Aguas, Alto Verapaz, Guatemala, collected April, 1906, by E. A. Schwarz."

From the foregoing it is apparent that *Rhinandrus* and *Zophobas* more closely resemble the Blaptinae than do any other genera of the Tenebrioninae. In fact the only consistent character separating them from the Blaptinae is the absence of any transverse, densely setose elevation on the labrum, a character present in all Blaptinae and absent in all Tenebrioninae.

GENERA OF SUBFAMILY TENEBRIONINAE.

Of the 23 genera of the subfamily Tenebrioninae in the United States, which Leng⁶ recognizes, larvae of the following 13 were available for study:

The genus *Polypdelurus* Eschscholtz, of which there are three species, is represented by *germinatus* Solier. The material consists of a larval skin and a reared adult. The larva was found by the author in a decayed oak twig at Falls Church, Virginia, July 25, 1918, and reared September 7, 1918.

Material of the genus *Rhinandrus* LeConte consists of several larvae, larval skins, a pupa, pupal remains, and reared adults of *sublaevis* Horn. The larvae were taken by H. G. Hubbard from the nest of a rat (*Neotoma albigula*) in Tucson, Arizona, during the period from January to June, 1897, and reared by T. Pergande. Doctor Schwarz states that it is very difficult to separate the adults from those of *Alobates sublaevis* (Beauvois), and he was at first in doubt as to which genus they belonged. He has not had an opportunity to examine the types. The larvae of these two genera, however, can be easily separated by the characters given in the key. On the other hand, the larvae of Hubbard are hard to separate from *Zophobas*, closely allied to *Rhinandrus*. For this reason Doctor Schwarz, like the writer, feels quite certain that the above-mentioned material is referable to *Rhinandrus*.

The genus *Zophobas* Blanchard contains only one species (*morio* Fabricius). A larval specimen was collected by E. A. Schwarz in the canal zone of Panama, February, 1911. Doctor Schwarz is not positive of the determination, but from a comparison of the characters of this with the closely allied *Rhinandrus sublaevis*, the writer feels quite certain that the determination is correct. Another larval specimen, collected by M. A. Palmer, in a cave at Guana Jay, Cuba, May 5, 1900, is very closely related to this genus.

The genus *Scotobates* Horn, consisting of two species, is represented in the national collection by *calcaratus* (Fabricius). Since this is one of the most abundant species in the eastern part of the

⁶ Leng, C. V., 1920, Catalogue of the Coleoptera of America, North of Mexico, pp. 218-219. The names of Leng is followed throughout in discussing the material represented under each genus.

United States, it is well represented. Many of the specimens have been reared.

The genus *Merinus* LeConte is represented by its only species, *laevis* (Olivier). The material, associated with reared adults, consists of several larvae and pupae collected by the writer near Falls Church, Virginia, July 23, 1918. The rest of the larval material, not associated by rearing experiments, consists of the following specimens: one larva taken by H. S. Barber from a dead branch in the top of a cherry tree at Occoquan, Virginia, July 4, 1908; a second larval specimen taken from beneath the bark of a dead maple tree at Dead Run, Virginia (opposite Plummer Island, Maryland), February 17, 1915 (H. G. Champion, collector); and a third specimen taken by the writer from under chestnut bark at Black Pond, Fairfax County, Virginia.

The genus *Xylopinus* LeConte is represented by both its species, *saperdoides* (Olivier) and *aenescens* LeConte. The material consists of several specimens of *saperdoides* associated by rearing, as follows: larval skin (larva taken by A. B. Champlain from a decayed sycamore tree at Harrisburg, Pennsylvania, April 7, 1913, and adult reared June 10, 1913); several larvae taken by F. C. Craighead from the heartwood of a dead, dry oak log at Great Falls, Virginia, May 30, 1916 (pupa collected with these transformed June 8, 1916); and several larvae taken by F. C. Craighead from beneath the bark of a decayed oak log near Great Falls, Virginia, May 25, 1919 (adults reared June 4, 1919, from part of the same collection). The material representing the species *aenescens*, consists of two larval skins; one of larva taken by T. E. Snyder from beneath the bark of a decayed oak at Shipman, Virginia, October 11, 1913, and from which adult was reared May 28, 1914; another of larva taken by T. E. Snyder at Black Mountain, North Carolina, March 22, 1913, which pupated April 15 and transformed to imago May 9, 1913.

The genus *Haplodrus* LeConte, of which there are three species, is represented by *fulvipes* (Herbst). The material associated by rearing consists of the following specimens: Four alcoholic larvae and one larval skin, the latter from a specimen which pupated May 15 and issued May 23, 1913, all out of a collection of five larvae taken by A. B. Champlain from a dead white pine at Charter Oak, Pennsylvania, April 10, 1913; and ten alcoholic larvae and one larval skin, the latter from a specimen which was reared through to adult April 16, 1914, all out of a collection of eleven larvae taken by E. A. Schwarz and H. S. Barber in a dry trunk of redbud at Plummer Island, Maryland, August 27, 1913. Of the material not associated by rearing there are several specimens taken from a rotten oak at Plummer Island, Maryland, by Messrs. Schwarz and Barber. Other specimens were collected as follows: Larval skin and adult taken by

R. C. Shannon from an oak log at Dead Run, Fairfax County, Virginia, August 6, 1915; and a larva collected by C. G. Marshall at Silver Hill, Maryland, February 22, 1916.

An undetermined larva, closely related to the genus *Hapladrus*, was taken by H. S. Barber at Brownsville, Texas, who suggests that it may represent a species belonging to the Mexican fauna.

The genus *Coelocnemis* Mannerheim, of which there are five species, is represented by *dilatocollis* Mannerheim. The material consists of two larval specimens, not associated by rearing, collected by D. W. Coquillett in Los Angeles County, California. The rest of the material is without specific determination and consists of two larvae taken by H. S. Barber from under stones at Williams, Arizona, between May 30 and June 8, 1901; one larva taken by E. A. Schwarz from the ground at Oracle, Arizona, July, 1898; and a third larval specimen taken by Schwarz and Barber from Cacao trees at Aguas Alta, Verapaz, Guatemala, April, 1906.

The genus *Iphthimus* Truqui, consisting of three species and three varieties, is represented by *serratus* (Mannerheim) and its varieties. The material representing the variety *sublaevis* Bland consists of: Larval specimens found in *Pinus ponderosa* at El Paso County, Colorado, February 26, 1914 (A. B. Champlain, collector), from a larva taken with them an adult was reared July 3, 1914; two larval specimens, not associated by rearing, taken by E. A. Schwarz and H. S. Barber at Williams, Arizona, during June, 1901; and a third larva taken from the decayed part of a telephone pole above the ground, on the Montgomery to New Orleans line, during August, 1921. The remaining specimens of the species *serratus*, not associated by rearing, were collected as follows: One larva from a decayed log in a Tamarack swamp at Detroit, Michigan (H. G. Hubbard, collector); a second larva taken at Field Brooks, California, May 19, 1903 (H. S. Barber, collector); and a third larval specimen from a sycamore log at Smith Point, Texas, November 15, 1918 (H. S. Barber, collector). One other larva, determined as *Iphthimus* species, was taken by H. G. Hubbard from a decayed log at Hood River, Oregon, May 21, 1892.

The material representing the variety *lewisi* Horn consists of four larvae taken together with adults, from under the bark of a tree at Lake Tahoe, California, July 8, 1891 (H. G. Hubbard, collector), and three pupae and one adult taken by F. G. Schaupp at Kelly, New Mexico, July, 1890.

The genus *Alobates* Motschulsky, of which there are three species, is represented by *pennsylvanica* (De Geer). As this species is very common in the eastern part of the United States there are many specimens of it. The larval material, of which part is associated by rearing, has been taken mainly from beneath the bark and in the outer

sapwood of maple, oak, chestnut, tulip, and sycamore trees. Adults of this species usually emerge about the first week in July. A single larval specimen, collected by D. W. Snyder at Luebo, Congo, Africa, appears to be closely related to this genus.

The genus *Glyptotus* LeConte, containing the single species *cribratus* LeConte, is represented by only one larval specimen. It was taken by H. S. Barber from a dead limb of a palm tree (*Thrinax*) on Big Pine Key, Florida, March 6, 1919. This specimen was determined by the writer, by locality, by comparison with size of adult and by a process of elimination of larval characters. Doctor Schwarz states that the species *cribratus* is about the only one there of its size and that it occurs in large numbers.

The genus *Upis* Fabricius is represented by its only species *ceram-boides* Linnaeus. The reared material consists of several larvae which were taken by S. A. Rohwer from beneath the bark of a dead white birch tree at Trout Lake, Wisconsin, September 23, 1913. Some larvae of this lot of material were caged September 27 and from them an adult emerged July 3, 1914. Of the material not associated by rearing experiments there are several larvae which were taken by H. G. Hubbard on the shores of Lake Superior, Michigan, July, 1876; and one larva taken from a decayed log by the same collector at Hood River, Oregon, May 21, 1892.

The genus *Tenebrio* Linnaeus, of which Leng recognizes the three species *obscurus* Fabricius, *molitor* Linnaeus, and *picipes* Herbst, is well represented by material from various parts of the United States and a few specimens from Europe. Part of the material from this country has been reared.

The larval habits of the two first-mentioned species are interesting in view of the fact that they have so many hosts. Besides being found in stored grain, they have also been found in a nest of *Bombus*, debris of a flying squirrel's nest, in *Tigridia*, in roots of *Althaea*, and in hydrolyzed sawdust, which was being fed to cattle.

The material representing *picipes* Herbst consists of the following: Larva and adult taken from a rotten log at Rockville, Pennsylvania, November 13, 1913 (H. B. Kirk, collector); three larvae and two adults found in nest of *Bombus* at Detroit, Michigan, probably in July, 1876 (H. G. Hubbard, collector); and a single larval specimen collected "on strawberries" at De Queen, Arkansas, March 26, 1921 (J. W. Berg, collector).

DISCUSSION OF LECONTE'S OLD GENUS NEATUS.

It may have been realized from the comments in the preceding discussion that, in the little group of species which are included under the genus *Tenebrio* Linnaeus, the species *picipes* Herbst occupies a position distinctly separate from the more typical forms, *molitor*

Linnaeus and *obscurus* Fabricius. This is largely due to differences in structures exhibited by the larvae. These can be briefly summarized as follows: Setae on the dorsal side of the back of mandible are scattered and numerous, instead of grouped with one seta anteriorly and two setae posteriorly as in the two latter forms mentioned above; and pygidium is apically acute, without cerci and with many short, spinelike setae along the lateral margins, instead of bicornute and with only two spinelike setae along each margin near cerci.

LeConte in his Classification of the Coleoptera of North America,⁷ founded a new genus *Neatus*, based on *tenebriodes* Beauvois. Later this species was identified with the European *Tenebrio picipes* Herbst. His genus was unfortunately lost sight of for many years.

From the standpoint of larval characters it should be recognized either as a good genus or a marked subgenus. Seidlitz, in Erickson's Naturgeschichte der Insecten Deutschland,⁸ gives a concise key to the larvae of *Tenebrio* which is here translated and slightly changed to properly set off *Neatus* LeConte as a distinct genus.

1. The last dorsal segment terminating in two hook-shaped points, on the sides of which there are at most two small spines..... 2.

The last dorsal segment terminating only in one point, near which on either side, are numerous small spines..... *Neatus picipes* Herbst.

2. The two points of the last dorsal segment distinctly bent upward..... 3.

1. The two points on the last dorsal segment almost horizontal

Tenebrio opacus Duftschmid.

3. The last dorsal segment shorter than its width at the base; the two points are little divergent; the upper side light yellow

Tenebrio molitor Linnaeus.

The last dorsal segment as long as its width at the base; the two points are more strongly divergent; the upper side is dark brown

Tenebrio obscurus Fabricius.

Later Mr. Edmund Reitter, in his Fauna Germanica⁹ treats *Neatus* as a subgenus of *Tenebrio* without giving any characters.

The genera previously described in this paper can be separated by the following characters:

KEY TO THE GENERA OF TENEBRIONINAE.

- Back of mandible opposite molar part with membranous elevation (*S*, figs. 60, 61, 62)..... 1.
- Back of mandible opposite molar part without membranous elevation (figs. 2, 5, and 32)..... 2.
1. Back of mandible opposite cutting edge with margin sharp (*c*, figs. 60 and 61); near condyle for ventral articulation of mandible, two strong setae (Lower California and Arizona)..... *Rhinandrus* LeConte.
 - Back of mandible opposite cutting edge with margin round (fig. 62); near condyle for ventral articulation of mandible, one strong seta (Central and South America and Florida)..... *Zophobas* Blanchard.

⁷ Part 1, 1861, p. 233.

⁸ Vol. 5, 1896, pp. 628-630.

⁹ Vol. 3, 1911, p. 347.

2. Mandibles apically trifid (a^1 , a^2 , a^3) with (figs. 32) or without (figs. 2 and 5) an additional dorsal tooth (t) between apex and molar part (m)— 3.
- Mandibles apically bifid (a^1 , and a^2) with an additional dorsal tooth (t) between apex and molar part (figs. 51, 53, 60, and 62)----- 12.
3. Left mandible with additional tooth between apex and molar part; right mandible without tooth----- 4.
- Both left and right mandibles without additional tooth between apex and molar part----- 10.
4. Ninth abdominal segment short and upwardly directed; dorsal shield of ninth articulating by lateral condyles with dorsal shield of eighth ring; cerci with basal projections (figs. 36, 37, 38, 39)----- 5.
- Ninth abdominal segment not short and upwardly directed, dorsal shield continuous with that of eighth segment; cerci without basal projections (figs. 14, 40, 45, 49)----- 6.
5. Eighth tergum posteriorly produced into a transverse series of conelike projections or teeth (fig. 36)----- An undetermined specimen.
- Eighth tergum entire, not produced into a transverse series of conelike projections (fig. 37)----- *Hapladrus* LeConte.
6. Pygidium with small seta-bearing spines anterior to cerci (figs. 9, 40, 41, 55)----- 7.
- Pygidium without small seta-bearing spines anterior to cerci (fig. 45)
Polypleurus Eschscholtz.
7. Epipharynx with many short, spinelike setae on the soft skinned part (fig. 1) (eastern and southern species)----- *Xylopinus* LeConte.
- Epipharynx with only two short, spinelike setae on the soft skinned part (*eph*, fig. 31)----- 8.
8. Pygidium with transverse row of strong, hook-shaped, seta-bearing spines anterior to cerci----- *Glyptotus* LeConte.
- Pygidium with small, but not hook-shaped, seta-bearing spines anterior to cerci (fig. 44)----- 9.
9. Trochanter and femur of all legs similarly armed with small seta-bearing spines (figs. 42 and 43) (northern and western species)
Ipthimus Truqui.
- Trochanter and femur of all legs not similarly armed; anterior pair with large, coarse, blunt, seta-bearing spines, second and third pairs armed with setae and a few small spines (figs. 34 and 35)
Alobates Motschulsky.
10. Pygidium with small seta-bearing spines anterior to cerci, dorsally with one pair stronger and bifid (figs. 9 and 14); prothoracic legs strong, considerably larger than rest; hypopharyngeal sclerite anteriorly tricuspidate, without median vertical projection (*hsc*, fig. 8); anal segment without projecting and retractile ambulatory warts (verrucae) (figs. 12 and 14); body soft membranous----- 11.
- Pygidium without seta-bearing spines anterior to cerci (fig. 45); prothoracic legs nearly the same size as rest (figs. 47 and 48); hypopharyngeal sclerite anteriorly tricuspidate with median, verticle projection bifid or grooved at apex (fig. 46); anal segment with two projecting and retractile ambulatory warts (verrucae) (*aw*, fig. 45); body corneous— *Scotobates* Horn.
11. Epipharynx with many short, spinelike setae on soft-skinned part, no two of which are distinctly larger or more prominent than rest (*eph*, fig. 1); back of mandible with two setae, one anteriorly at base of teeth, other near fossa for dorsal articulation of mandible (figs. 2 and 15); trochanter

- of prothoracic leg usually³⁰ with four consecutive seta-bearing tubercles beneath callous wart on apex (figs. 16, 17). Eastern United States, Indiana, and Missouri)----- *Merinus* LeConte.
- Epipharynx with very few spinelike setae on soft-skinned part, two of which are distinctly larger and more prominent than rest (*eph*, fig. 15); back of mandible with four setae, two anteriorly at base of teeth and two posteriorly near fossa for dorsal articulation of mandible; trochanter of prothoracic leg usually with one small and two large seta-bearing tubercles beneath callous wart at apex (fig. 18) (northern species)----- *Upis* Fabricius.
12. Pygidium with apically bicornute cerci (figs. 49, 50, 55)----- 13.
Pygidium without cerci (fig. 52)----- *Neatus* LeConte.
13. Pygidium without wartlike projections anterior to cerci but with two short, spinelike setae on each side near cerci (figs. 49 and 50); side margins sharp; anal segment with two projecting and retractile ambulatory warts (verrucae) (*av*, fig. 49)----- *Tenebrio* Linnaeus.
- Pygidium with a transverse series of wartlike chitinous projections anterior to cerci, each one apically with spinelike projections (fig. 55); side margins not sharp; anal segment without projecting and retractile ambulatory warts (verrucae) (figs. 10, 40, 44)----- *Coelocnemis* Solier.

LARVA AND PUPA OF *MERINUS LAEVIS* (OLIVIER).

While collecting in a wood lot near Falls Church, Virginia, July 23, 1918, the author found several prepupal larvae, pupae, and adults under the bark of a large, decaying limb of a maple tree which had fallen to the ground. The material was determined by Dr. E. A. Schwarz as *Merinus laevis* (Olivier). Previous records show that the larvae have also been taken from under the bark of chestnut, red oak, and cherry trees. According to Leng this species is found principally in the eastern part of the United States, but specimens in the national collection and in the collection of the Bureau of Entomology, Division of Forest Insects, show that it occurs as far west as Indiana and Missouri. In the North, *Merinus* is replaced by the closely allied genus *Upis*.

GENERAL MORPHOLOGICAL DESCRIPTION OF THE LARVAE.³¹

Length 40 mm., color testaceous with head somewhat darker, submentum, presternum, prehypopleurum and anterior-lateral margin of the prothoracic tergum, castaneous-testaceous; anterior and posterior margins of prothorax and posterior margins of the following segments finely striated longitudinally. Surface coriaceous. Form elongate, cylindrical, about ten times longer than wide; dorsally con-

³⁰ The spines of the legs, while constant to a certain degree, sometimes vary in number and development in different specimens, and occasionally on opposite legs of the same specimens.

³¹ Conforming with Doctor Böving's description of the larva of *Embaphion muricatum* (Journ. of Agri. Research, vol. 22, 1921, no. 6, ser. K., 103, pp. 323-334) to facilitate a comparison between the morphological structures of these two species, which represent the two distinct, but in many respects closely related subfamilies, Tenebrioninae and the Blaptinae.

vex, ventrally slightly flattened, pygidium, subtrapezoidal, apically bicornute. Head, thorax, and abdomen covered with pale, thin, reddish brown hairs.

Cranium rounded, nutant, exserted, two-thirds broader than long (from epistomal margin (*epi*, fig. 3) to foramen occipitale), broadest medianly, dorsally somewhat convex. Anterior frontal angle (*fa*) rounded. Frons (*f*) three-fourths the length of cranium, about half as long as wide, with extreme width anteriorly; sides anteriorly and posteriorly convex, medianly concave; frons somewhat triangular, near the center two small circular impressions. Epicranial halves (*epc*) meeting dorsally; epicranial suture about one-fourth the length of cranium; the halves ventrally separated by gula (*gu*, fig. 7); epicranium with evenly distributed thin setae. Gula distinct, coriaceous, barrel-shaped, with ventral tentorial pits (*tp*) just below the middle of the side margins. Clypeus (*cl*, fig. 3) trapezoidal, widest behind, length to extreme width, one to three; medianly with a transverse deepening, set on each side with two well-developed setae near the lateral margin; anterior third testaceous, posteriorly castaneous-testaceous. Labrum (*lab*) well-developed, movable, transversely rectangular, a little more than twice as wide as long, anterior margin slightly crenate, anterior corners rounded; disk between the center and each lateral margin with two large setae,¹² the one nearer the margin a little more anteriorly placed; on the anterior half of the lateral margins and on the front margin a series of long, thin, slightly chitinized setae and between these many irregularly placed short, rigid setae; behind those on the anterior corner but on the ventral side of labrum, usually three shorter, stronger, curved setae. (Fig. 1.) Ocelli composed of two groups on each side, just behind the outer antennal ring; both transverse, the anterior one composed of three, more or less fused lenses, the posterior one of two partly fused lenses; near ocelli a few slender setae. Antenna close behind the mandible, attached to distinctly colored rim below the dorsal mandibular fossa; basal antennal membrane well developed, with posterior portion somewhat corneous; three articles; basal article clavate, about as long as clypeus; second article shorter than first, about as long as labrum, cylindrical; apical article very small, cylindrical, about one-third the length of the second, carrying one short seta; no supplementary appendix from second article beside the apical article. Mandibles (figs. 2 and 5) both alike, apically trifid (a^1 , a^2 , a^3), obtusely pointed, with the median tooth (a^1) larger and longer; molar part (*m*) of right mandible with crown bearing four transverse somewhat arched ridges which fit into corresponding cavities of the left molar part; cutting part smooth, ventrally slightly excavated; exterior surface ("the

¹² These two setae occupy always the same position, while the number, size, and position of the rest of the labral setae vary somewhat according to different specimens.

back of the mandible"), distally (*c*) rounded above, without margination, bearing a single weak seta on dorsal surface arising from slight excavation at base of apical teeth; proximally (*p*, fig. 5) (opposite the molar part) excavated, bearing two setae, a long thin one on dorsal surface above fossa and another short one on ventral surface near condyle. Maxilla dorsally almost completely covered by mandible, coriaceous; palpus surmounting mala (*ma*, fig. 7) with one-third of its own length; palpiger maxillae (*pag*) small, apically on outer side with semicircular chitinization, on inner side fused with stipes; three articles, basal article clavate, about one-third of the entire length of palpus, with minute seta near base on outer side; second article subequal with basal, cylindrical, bearing two thin setae anteriorly; apical article, shorter than second, conical, with soft tip, apically covered with minute tactile hairs; mala on dorsal (buccal) surface (*ma*, fig. 6) with a median longitudinal series of well-developed somewhat curved setae and a corresponding series along the free margin, apically with a few strong setae beneath which extends an inner series of small, weak but distinct setae; mala on ventral (exterior) surface, (*ma*, fig. 7) apically bearing a few stiff setae. Anterior malar margin truncate, median emargination divided into two parts, inner part of which is chitinized and obtusely pointed; mala slightly concave on the inside, slightly convex on the outside. Stipes (*sti*) fused with mala; base of stipes (*ba*) near cardo articulation, narrowed, bearing a single, long, thin seta; proximal half of inner margin of stipes (*is*₁) connected with maxillary articulating area (*ar*), distal half (*is*₂) immediately behind mala, free, bearing a short, weak seta near margin; just below palpiger, near exterior margin, three long, thin setae. Cardo (*ca*) about as long as maxillary palpus, entire, adjacent to curved hypostomal thickening (*hyp*) between fossa for ventral mandibular condyle (*fm*) and fossa for tip of cardo (*fc*); inner margin of cardo near center, with an indication of fusion with maxillary articulating area. Maxillary articulating area (*ar*) protuberant, divided into halves; exterior half connected with maxilla, subdivided into an upper and lower portion; interior half connected with submentum, entire; no setae. Submentum (*sm*) distinct, trapezoidal, broadest posteriorly; side margins slightly concave, near the middle of each, a long thin seta. Mentum (*me*) barrel-shaped, side margins free; on each side two long, thin setae. The two stipites labii (*stla*) fused into a slightly chitinized unit with a pair of long, thin setae. Labial palpus about half as long as maxillary palpus; two articles; basal article cylindrical, slightly shorter than that of maxillary palpus; apical article conical, shorter than basal article, apex covered with minute tactile hairs. Ligula (*li*, figs. 6 and 7) of medium size, slightly broader than long, apically somewhat truncate, bearing several rather short, rigid setae along the front margin and on the

buccal surface.¹³ Hypopharyngeal sclerite (*hsc*, figs. 4, 8, 13) supported above the hypopharyngeal bracon (*hbr*) by a chitinous plate extending from the latter sclerite; nearly square, projecting, strong, heavily chitinized; anteriorly tricuspidate; disk excavate, in center thinly chitinized. The hypopharyngeal bracon is a well-developed rod in the buccal membrane between the ventral mandibular articulations and the hypopharyngeal region; in the latter region the rod is heavily chitinized, and here somewhat fused with plate extending to the hypopharyngeal sclerite, near the former region slightly membranous. Epipharynx (*eph*, fig. 1) forming the buccal surface of labrum, slightly coriaceous with a posterior, transverse, broad, sinuous, chitinous band, just behind which are two chitinous triedral projections; on the slightly coriaceous part, anterior to the band, many short, rigid setae arranged in a somewhat semicircular manner about the chitinous band; medianly, near the anterior margin, a few scattered ring-shaped punctures. Legs well developed, surrounded at base by a large articulating area (*ar*). Prothoracic legs (figs. 14, 16, and 17) considerably stronger than those of mesothorax and metathorax (fig. 22); coxae (*cox*) of the first pair attached so closely together that they are nearly contiguous at the base (fig. 20), nearly as long as wide, a few thin setae on exterior and interior surfaces, mostly along anterior margin near articulating membrane between coxa and trochanter; trochanter (*tr*), about as long as coxa, inner side distally with a callous wart, below which are usually four consecutive spinelike projections or tubercles, each bearing short seta, near these a few thin setae; femur (*fe*), about as long as, and somewhat wider than trochanter, armed with two spinelike, seta-bearing tubercles with a much smaller one near them, besides many strong scattered setae; tibia (*ti*) slightly shorter and much thinner than femur, proportions about two to three, distally armed with three spinelike setae, besides many thin setae; tarsus (*ta*) a little more than half the length of tibia, claw-shaped and strong, basal portion enlarged,¹⁴ backward facing surface distally excavate, with proximal portion round, rather soft skinned, bearing a strong seta distally at base of excavation on either side. Second and third pairs of legs inserted farther apart than the first pair, but legs considerably thinner and not as long; the proportions of the articles also about the same as those of first pair, excepting the coxae which are nearly twice as long as wide.

Presternal area (*y*, fig. 20), in the intersegmental region between head and prothorax, slightly chitinized, twice as wide as gula;¹⁵

¹³ Ligula is conically pointed and apically set with one pair of long setae in *Emdaphion* and also in certain species of *Eleodes* and in a few genera of *Tenebrioninae*.

¹⁴ Enlarged at base on exterior side more than that of *Emdaphion*.

¹⁵ Compare with *Emdaphion* in which the united presternal areas have nearly the same width as gula and are partly separated by the preeusternal subdivision of eusternum.

anteriorly on each area with two minute hairs, and posteriorly below chitinizations with a long thin seta. Immediately below, and not separating the presternal areas, a suboval single area bearing two setae. This suboval area is a preeusternal subdivision of eusternum (*peu*).

Ventral intersegmental region between prothorax and mesothorax and between mesothorax and metathorax, membranous, composed of distinct post-sternellar and preepipleural areas but with indistinct presternal areas.¹⁶

Prothorax with eusternum (*eu*, fig. 20) large, subtriangular; with prehypopleural chitinization (h_1), large and strong, internally adjacent to ventral intersegmental region; sternellum (*stl*), well developed, somewhat smaller than eusternum, forming with eusternum a clepshydral region; poststernellum (*s*) transverse, somewhat spindled-shaped; prothoracic tergal region (fig. 14) transverse, subquadrate, with anterior and posterior margins as mentioned above; just back of anterior margin and also near posterior margin, a transverse row of long, thin hairs, lateral margin with few scattered hairs. Mesothorax and metathorax with large subtriangular preeusternal regions (*peu*) bearing a few short hairs,¹⁷ and with V-shaped eusternal (*peu*) regions; near anterior part of prehypopleural chitinizations (*h*) three small hairs; presternal areas not demarkated. Prehypopleural chitinizations (*h*) well developed; posthypopleural chitinization (h_2) very small, not to be confused with the adjacent rather large, oval chitinization in the articulating skin of the leg; coxae rather distant; sternellum anteriorly fused with eusternum; poststernellum of metathorax not present; preepipleurum of mesothorax and metathorax (e_1) subtriangular, the former carrying first thoracic spiracle, the latter the rudimentary spiracle; median area of epipleurum (*e*) of both segments well developed, postepipleurum (e_2) small; mesothoracic and metathoracic tergal shields (*te*, figs. 14 and 20) transverse, subrectangular, about twice as wide as long, right behind anterior margin a dark serrated transverse line behind which a row of small oval elevations as long as the line, posterior margin with transversal band finely striated longitudinally; setae arranged as on prothoracic shield.

The six anterior typical abdominal segments cylindrical, somewhat wider than long, with fused sternal areas (*ster*); hypopleural region (hp) indistinct; epipleural region (*ep*) narrow; tergal region (*ter*) transverse, rectangular, having on the first abdominal segment right back of anterior margin, dark, serrated, transverse line (fig. 14) and behind this a row of elevations similar to those on the

¹⁶ In *Embaphion* ventral intersegmental region is formed by distinct poststernellar, preepipleural, and presternal areas.

¹⁷ In *Embaphion* preeusternal subdivision of eusternum small and indistinct.

mesothorax and metathorax; on the second and third abdominal terga the serrated, transverse line is lacking but the elevations are present; on the rest of the terga both line and elevations are lacking; on the posterior margin of each tergum a faint transverse, longitudinally striated band; spiracles laterally placed, with faint horizontal line above. Setae scattered, rather soft, on sternal areas arranged in two transverse rows; on epipleura none; on terga, below spiracle a few scattered setae, above with two transverse series. The seventh and eighth abdominal segments are similar to the anterior ones but somewhat longer. The ninth abdominal segment (figs. 9, 10, 12, 14) is somewhat smaller than the preceding segments; sternum soft, subtrapezoidal, widest anteriorly; tergum or pygidium, slightly raised longitudinally, apex bicornute; proximally (anterior to cerci), a pair of bifid seta-bearing spines, usually on either side and slightly anterior to these, another but much smaller pair; sometimes, about base of cerci, one or more minute seta-bearing spines; setae on sternum arranged in two transverse series; on pygidium a continuous series along lateral and posterior-ventral margins, and two transverse series dorsally. The tenth abdominal or anal segment (figs. 10, 12, 14), very small, with ventral lip inwardly faintly bilobed. Spiracles (fig. 11) annular, broadly oval, transversely placed, openings linear, unprotected by hairs at bottom of cup-shaped peritreme.

General morphological description of pupa of *Merinus laevis*.¹⁸

Length 28 mm.; width of body 6 mm.; greatest width from knee to knee 9 mm. Color yellowish white; surface somewhat coriaceous; form elongate, subcylindrical, slightly arcuate; dorsally moderately depressed; head somewhat flexed against prosternum; appendages semitranslucent; pygidium subtrapezoidal, apically bicornute. Head, thorax, with exception of elytra, and abdomen, sparsely haired.

Head, concealed beneath prothorax (figs. 21, 23, 27); cranium convex, longer than wide (from clypeal margin to foramen occipitale) widest anteriorly, bearing a few weak hairs; frons, more or less distinct (according to stage of development of pupa), transverse, about one-third as wide as long, separated from clypeus by a distinct transverse suture; between base of antenna and frons and fused with both, arises a conical projection, directed laterally; clypeus subtrapezoidal, widest posteriorly, anteriorly indistinctly separated from labrum; along latter margin a transverse series of soft hairs; labrum bent under, anterior margin bilobed; antenna curving backward against side of prothorax over profemora, at which point it is

¹⁸ For the sake of convenient comparison, given in conformity with Doctor Blaisdell's description of the pupa of *Eileodes clavicornia* Eschscholtz (U. S. Nat. Mus. Bull. 63, pp. 500-501) of the Tenebrionid subfamily Blaptinae, which, as mentioned in footnote 11, is in many respects closely related to the Tenebrioninae.

scarcely visible when viewed from below. Mandible apically chitinized, proximally with two short soft hairs, basally with a soft hair near each articulation. Pronotum convex, wider than long, subrectangular, anterior margin feebly and broadly emarginate, frontal angle rounded, side margins arcuate, posterior corners more angular, posterior margin broadly emarginate; all but part of posterior portion, covered with fine, short setae. Mesonotum, slightly convex, transverse, sparsely haired; elytral pads passing obliquely backward between tibia and tarsus of mesothoracic and metathoracic legs, apical fourth visible from beneath; scutellum trapezoidal, widest anteriorly. Metanotum, a little longer than mesonotum, slightly sinuate behind; setae arranged as on mesonotum.

Legs somewhat prominent laterally, not appressed against body, distinctly compressed, not very broad; tarsi separated from each other in median line, except the metatarsi which are in contact from base of metatarsus to claw; coxae and sterna visible in the median line.

Abdominal segments convex ventrally, less so dorsally; first six terga transversely rectangular; seventh and eighth arcuate posteriorly; each tergum bearing two transverse rows of weak setae; lateral portion of terga of first seven abdominal segments produced into subrectangular, platelike processes.¹⁹

Lateral process of first abdominal tergum anteriorly (fig. 19) drawn out into a spur directed outward with tip chitinized, bearing at base a long, thin seta; medianly (*m*) deeply emarginate; posteriorly (*p*) forming bifid spur directed laterally and with tip chitinized, base of anterior tooth (*t*) bearing seta; second to sixth lateral processes inclusive (figs. 24, 25), usually alike,²⁰ having anterior spur (*a*) bifid, with one tooth (*t*) hooklike and directed inward and other tooth (*t*) directed outward with seta at base, posterior spur (usually) bifid, directed posteriorly and with seta at base of tooth (*t*); seventh process as sixth, except posterior spur (*p*, fig. 26) which is single with seta at base and is constant; eighth tergum (fig. 29) with plate-like processes reduced to two minute chitinous spines, one medianly (*m*) and one posteriorly placed (*p*), each with a seta at base; ninth tergum or pygidium, subtrapezoidal (figs. 28, 30) bearing apically two long, conical cerci, chitinized at tips and each bearing at base, on outer side, a short seta; ninth tergum medianly with two fleshy spinelike projections, the apices of which are bifid and chitinized; anterior margin of tergum concave, lateral margins slightly arcuate,

¹⁹ Blaisdell, in his description of the pupa of *Eleodes olivicornis*, refers to these plate-like processes as arising from the pleurum. The author prefers to accept Schiodte's view in which he refers to them as arising from the tergum.

²⁰ Sometimes the posterior spur may be single instead of bifid (*p*, fig. 24) on lateral process of second abdominal segment, or the opposite (*t*, fig. 26) on anterior spur of seventh segment.

posterior truncate; lateral margins bearing few short setae. Sterna of first six abdominal segments (figs. 21 and 27) transversely rectangular, seventh and eight more arcuate posteriorly; ninth transverse, subtrapezoidal; tenth very small, tubular (fig. 30). First eight abdominal segments bearing two transverse rows of short, thin setae; ninth with three short setae on each lateroposterior margin; tenth without setae. Spiracles (fig. 21) annular, broadly oval.

EXPLANATION OF PLATES.

Figures drawn with aid of camera lucida by the author. All figures from 1 to 30, inclusive, except 15 and 18, refer to *Merinus laevis*, the latter refer to *Upis ceramoides*. Figures 1 to 18, inclusive, 20, and 22 refer to the larvae; Figures 19, 21, and 23 to 30, inclusive, refer to the pupa; Figures 31 to 68, inclusive, refer to many different genera and species.

PLATE 1.

- FIG. 1. *Merinus laevis*. Epipharynx (*eph*) and anterior margin of labrum.
2. *Merinus laevis*. Dorsal side of right mandible; a^1 , a^2 , a^3 , the tricuspidate apex; *m*, molar part; *c* rounded surface on exterior side of cutting edge; *p*, excavation opposite molar part.
3. *Merinus laevis*. Head; *lab*, labrum; *cl*, clypeus; *fa*, anterior angle of frons; *epi*, epistoma; *f*, frons; *epc*, epicranium.
4. *Merinus laevis*. Lateral view of buccal cavity with mouth parts removed; *cl*, clypeus; *lab*, labrum; *eph*, side of epipharynx; *hsc*, hypopharyngeal sclerite; *oes*, esophagus with entrance shown; *hbr*, hypopharyngeal bracon.
5. *Merinus laevis*. Ventral side of left mandible. Explanation same as for Figure 2.
6. *Merinus laevis*. Maxillae seen from the buccal cavity; hypopharyngeal region removed; *ma*, mala; *li*, dorsal (buccal) surface of ligula.
7. *Merinus laevis*. Second and third mouth parts from ventral side; *epc*, epicranium; *gu*, gula; *tp*, ventral tentorial pit; *sm*, submentum; *me*, mentum; *stla*, stipes labii; *ll*, ligula; *hyp*, hypostoma; *fm*, fossa for ventral articulation of mandible; *fc*, fossa for cardo; *ar*, maxillary articulating area; *ca*, cardo; *sti*, stipes maxillaris; *bs*, base of stipes; *is₁* and *is₂*, inner margin of stipes; *ma*, mala maxillaris; *pag*, basal membrane of maxillary palpus.
8. *Merinus laevis*. Hypopharyngeal region, esophagus and hypopharyngeal bracon, corresponding to the piece removed from Figure 6, *hsc*, hypopharyngeal sclerite; *hbr*, hypopharyngeal bracon; *fm*, mandibular ventral fossa; *oes*, esophagus.
9. *Merinus laevis*. Eighth and ninth terga; dorsal view.
10. *Merinus laevis*. Ninth abdominal ("pygidial") segment; lateral view.
11. *Merinus laevis*. First thoracic spiracle.
12. *Merinus laevis*. Pygidium; ventral view; *IX*, ninth abdominal ("pygidial") segment; *X*, tenth abdominal ("anal") segment, showing its upper lip; lower lip not visible.
13. *Merinus laevis*. Hypopharyngeal region; same structures as in Figure 8 reversed; *hsc*, base from which hypopharyngeal sclerite originates; *hbr*, hypopharyngeal bracon; *fm*, mandibular ventral fossa; *oes*, esophagus.
14. *Merinus laevis*. Lateral view of larva.

PLATE 2.

- FIG. 15. *Upis ceramboides*. Epipharynx (*eph*) and anterior margin of labrum.
16. *Merinus laevis*. Right prothoracic leg, showing posterior face; *cox*, coxa; *tr*, trochanter; *fe*, femur; *ti*, tibia; *ta*, tarsus.
17. *Merinus laevis*. Same leg as in Figure 16; anterior face; *cox*, coxa.
18. *Upis ceramboides*. Right prothoracic leg; anterior face; *cox*, coxa.
19. *Merinus laevis*. Pupa; lateral platelike processes of first abdominal segment; *a*, anterior spur; *m*, median emargination; *p*, posterior bifid spur; *t*, anterior tooth of posterior bifid spur.
20. *Merinus laevis*. Larva; ventral view of part of head, of the thoracic segments and of the anterior portion of first abdominal segment; *epc*, epicranium; *gu*, gula; *y*, presternum; *pou*, preeusternal subdivision of eusternum; *eu*, eusternum; *sth*, sternellum; *z*, poststernellum; *ar*, articulating membrane of leg; *h₁*, prehypopleurum; *h₂*, posthypopleurum; *e*, epipleurum; *e₁*, preepipleurum; *e₂*, postepipleurum; *te*, thoracic tergite; *ster*, sternal shield of abdominal segments; *hp*, abdominal hypopleurum; *ep*, abdominal epipleurum; *ter*, abdominal tergite.
21. *Merinus laevis*. Lateral view of pupa.
22. *Merinus laevis*. Metathoracic right leg of larva; anterior face.
23. *Merinus laevis*. Dorsal view of pupa.
24. *Merinus laevis*. Pupa; lateral platelike process of second abdominal segment; *a*, anterior spur; *m*, median emargination; *p*, posterior spur; *t*, anterior tooth of spur; *t₁*, posterior tooth of spur.
25. *Merinus laevis*. Pupa; lateral process of sixth abdominal segment. Explanation of letters same as for Figure 24.
26. *Merinus laevis*. Pupa; lateral process of seventh abdominal segment. Explanation of letters same as for Figure 24.
27. *Merinus laevis*. Pupa; ventral view.
28. *Merinus laevis*. Pygidium of pupa; dorsal view.
29. *Merinus laevis*. Part of eighth tergite of pupa, showing lateral process reduced to two minute spines; *m*, median spine; *p*, posterior spine.
30. *Merinus laevis*. Pygidium of pupa; ventral view; *VIII*, part of sternum of eighth abdominal segment; *IX*, sternum of ninth abdominal ("pygidial") segment; *X*, tenth ("anal") abdominal segment.

PLATE 3.

- FIG. 31. *Allobates pennsylvanica*. Epipharynx (*eph*) and anterior margin of labrum.
32. *Allobates pennsylvanica*. Dorsal side of left mandible; *a₁*, *a₂*, *a₃*, the tricuspidate apex; *m*, molar part; *c*, rounded surface on exterior side of cutting edge; *e*, excavation opposite molar part; *t*, additional tooth between apex and molar part on left mandible.
33. *Allobates pennsylvanica*. Dorsal side of right mandible. Same explanation for letters as on Figure 32.
34. *Allobates pennsylvanica*. Right prothoracic leg, showing posterior face; *cox*, coxa; *tr*, trochanter; *fe*, femur; *ti*, tibia; *ta*, tarsus.
35. *Allobates pennsylvanica*. Right mesothoracic leg, posterior face. See explanation of letters for Figure 34.

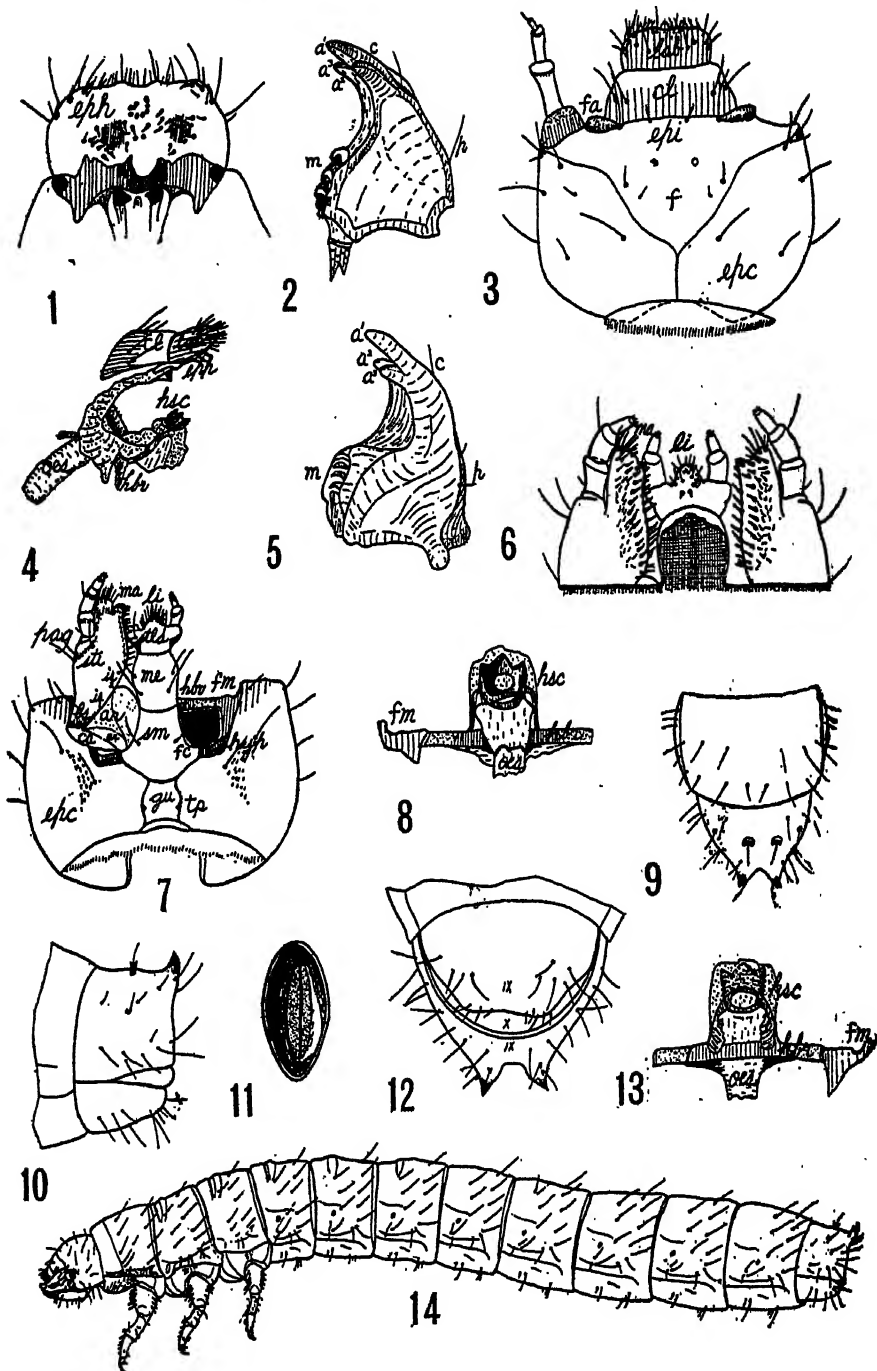
- Fig. 36. *Undetermined species*. Lateral view; VIII, eighth abdominal segment, showing *cp*, conelike projections; IX, ninth abdominal ("pygidial") segment, showing *bp*, basal projections of cerci and *cd*, lateral articulating condyles; X, tenth abdominal ("anal") segment, showing upper and lower lips.
37. *Undetermined species*. Posterior view of same structures as in Figure 36. Explanation same as for Figure 36.
38. *Haplandrus femorata*. Lateral view; VIII, eighth abdominal segment; IX, ninth ("pygidial") abdominal segment; X, tenth ("anal") abdominal segment; *bp*, basal projections of cerci; *cd*, articulating condyles.
39. *Haplandrus femorata*. Posterior view of same structures as in Figure 38. Explanation same as for Figure 38.
40. *Haplandrus femorata*. Lateral view of ninth abdominal ("pygidial") segment.
41. *Haplandrus femorata*. Posterior view of same structures as in Figure 40.
42. *Iphthimus sublaevis*. Right prothoracic leg, posterior face; *cox*, coxa.
43. *Iphthimus sublaevis*. Mesothoracic leg, posterior face; *cox*, coxa.
44. *Iphthimus sublaevis*. Lateral view of ninth abdominal segment.
45. *Scotobates calcarata*. Lateral view of eighth, ninth, and tenth abdominal segments; X, tenth abdominal segment with upper and lower lips; *aw*, projected ambulatory wart.
46. *Scotobates calcarata*. Hypopharyngeal region, hypopharyngeal bracon and esophagus; *hse*, hypopharyngeal rite showing median projection bifid at apex; *hbr*, hypopharyngeal bracon; *fm*, mandibular ventral fossa; *oes*, esophagus.
47. *Scotobates calcarata*. Right prothoracic leg; *cox*, coxa.
48. *Scotobates calcarata*. Right mesothoracic leg, showing it nearly the same size as the prothoracic one.
49. *Tenebrio obscurus*. Lateral view of pygidium. Explanation of letters same as in Figure 45.
50. *Tenebrio obscurus*. Pygidium, dorsal view.
51. *Tenebrio molitor*. Dorsal view of left mandible; *a*¹ and *a*², the bicuspidate apex; *t*, additional tooth near molar part; *m*, molar part; *e*, excavation opposite molar part; *c*, rounded surface on exterior side of cutting edge.

PLATE 4.

Fig. 52. *Neatus picipes*. Pygidium; dorsal view.

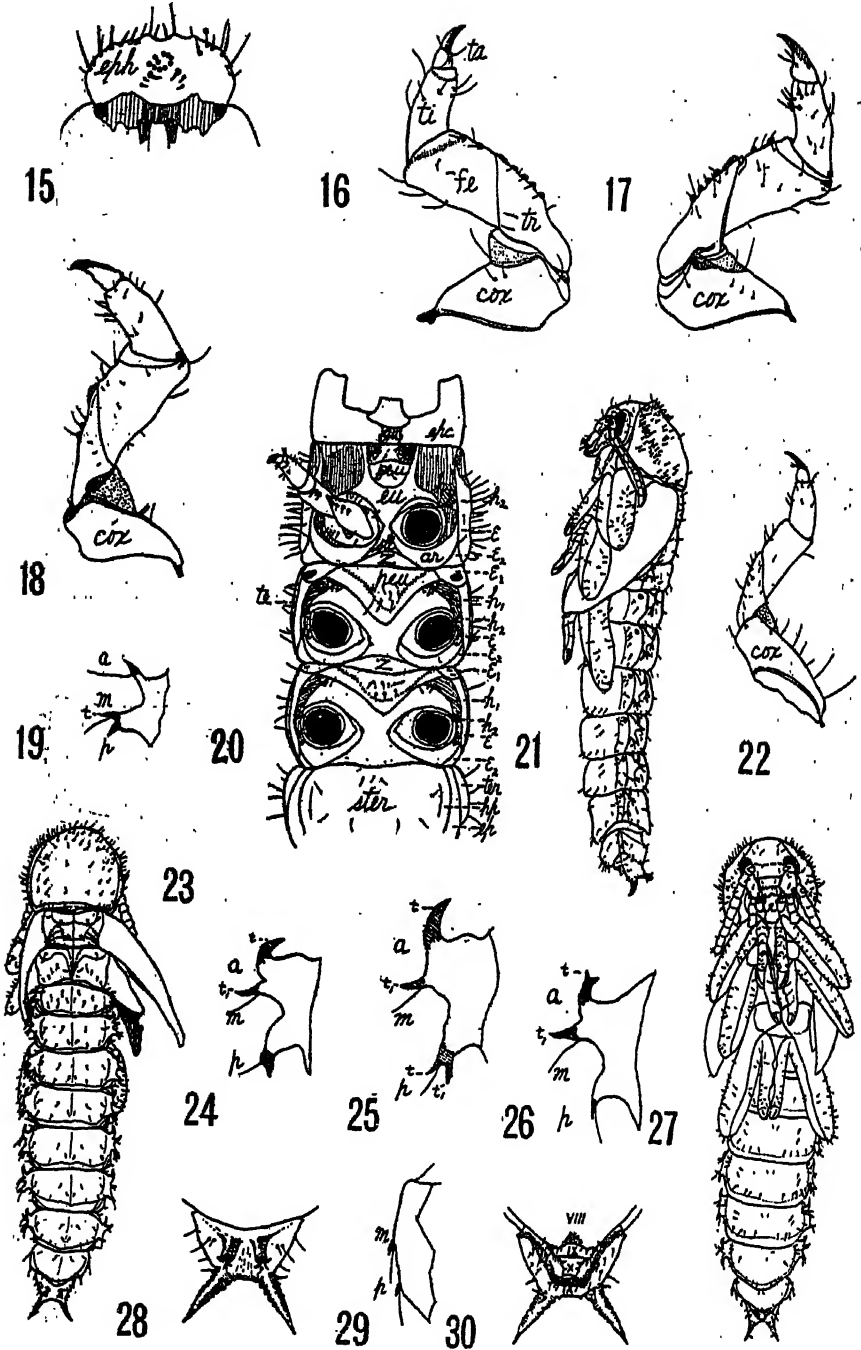
53. *Neatus picipes*. Dorsal view of left mandible. Explanation for letters as in Figure 51.
54. *Coelocnemis californica*. Dorsal view of right mandible; *a*¹ and *a*², the bicuspidate apex; *t*, additional tooth near apex; *m*, molar part; *e*, excavation opposite molar part; *c*, rounded surface on exterior side of cutting edge.
55. *Coelocnemis californica*. Dorsal view of ninth abdominal ("pygidial") segment.
56. *Rhinandrus sublaevis*. Dorsal view of ninth abdominal segment.
57. *Rhinandrus sublaevis*. Lateral view of ninth and part of tenth abdominal segment; *aw*, ambulatory wart partly retracted.
58. *Rhinandrus sublaevis*. Right prothoracic leg, posterior face; *cox*, coxa.

- FIG. 59. *Rhinandrus sublaevis*. Right mesothoracic leg, posterior view. Notice the difference in size between this leg and the prothoracic leg Figure 58.
60. *Rhinandrus sublaevis*. Ventral view of right mandible; a^1 and a^2 , the bicuspidate apex; t , additional tooth near apex; m , molar part; e , excavation opposite molar part; s , membranous elevation opposite molar part; c , back with sharp margin of mandible opposite cutting part.
61. *Rhinandrus sublaevis*. Dorsal view of right mandible. The mandible is old and worn, so that the apical teeth and molar part are not sharp as in Figure 60. Explanation of letters same as in Figure 60.
62. *Zophobas morio*. Ventral view of right mandible; the back opposite the cutting part with round margin. Explanation of letters same as in Figure 60.
63. *Eleodes tricotat*. Pygidium, dorsal view; apex acute.
64. *Eleodes tricotata*. Ventral view of right mandible. Explanation of letters same as in Figure 60.
65. *Eleodes tricotata*. Dorsal view of right mandible. Explanation of letters same as in Figure 60.
66. *Eleodes opaca*. Pygidium, dorsal view, apex obtuse and rounded.
67. *Eleodes opaca*. Lateral view; IX , ninth abdominal segment; X , tenth abdominal segment; aw , ambulatory wart.
68. *Eleodes carbonaria*. Pygidium, dorsal view, apex obtuse and mucronate as in *Blaps*.



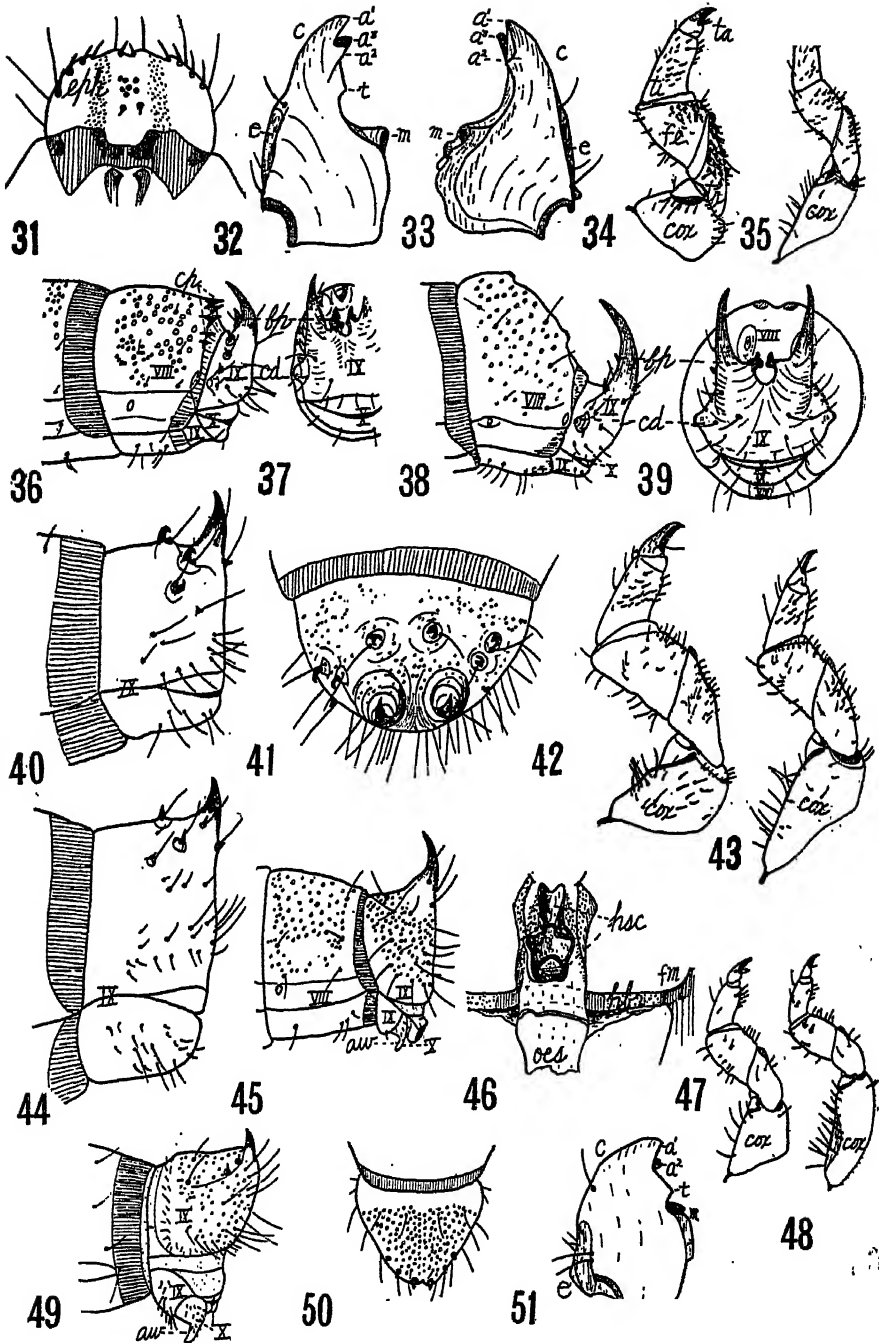
LARVAE OF TENEBRIONINAE

FOR EXPLANATION OF PLATE SEE PAGE 19



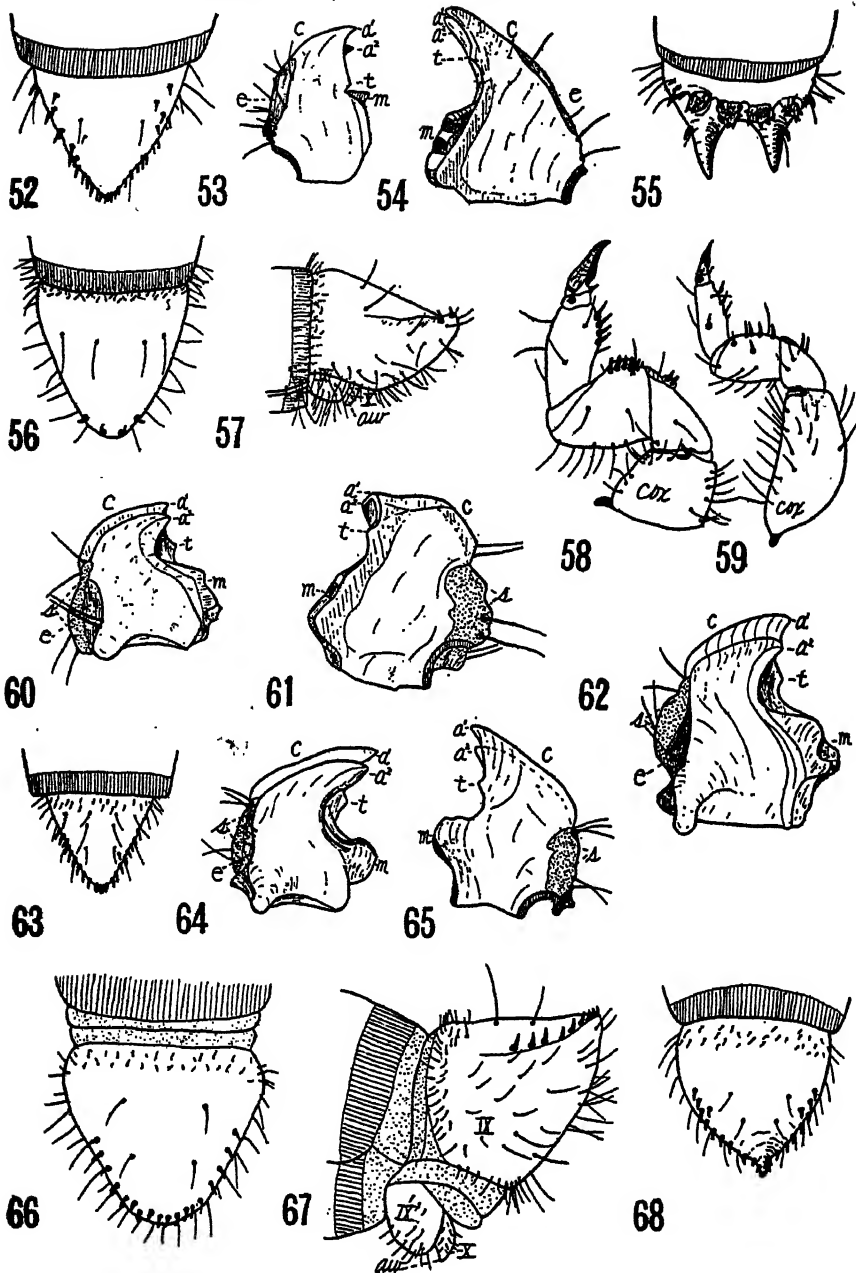
LARVAE AND PUPAE OF TENEBRIONINAE.

FOR EXPLANATION OF PLATE. SEE PAGE 29



LARVAE OF TENEBRIONINAE.

FOR EXPLANATION OF PLATE SEE PAGES 20 AND 21.



LARVAE OF TENEBRIONINAE.

FOR EXPLANATION OF PLATE SEE PAGES 21 AND 22.

MIOCENE AND PLEISTOCENE CIRRIPIEDIA FROM HAITI.

By HENRY A. PILSBRY,

Of the Academy of Natural Sciences, Philadelphia.

It is well known to workers on sessile barnacles that while the subgenera of the genus *Balanus* rest upon differences in the structure of the walls and basis, the specific distinctions are mainly based upon the opercular plates. No species can be considered well established until these plates are known. Nevertheless, in dealing with forms of a restricted area it is not difficult to assort the specimens into species by characters of the walls alone, and to determine them if all described species of the region in question are accessible for comparison, either as specimens or represented by sufficient accounts of the wall characters.

Thus, most or all of our American Tertiary Balani can be distinguished from one another by characters of the walls. But part of them can not be compared with species of the European Tertiary which were defined by the opercular plates without regard to the internal structure of the wall plates.

BALANUS, near EBURNEUS Gould.

A small barnacle, about 11 mm. in greatest diameter. The plates of the wall are smoothish with broad radii, as in *B. eburneus*. The rostrum has 11 tubes. Except close to the base these are closely septate. The septa are closer than in any *B. eburneus* examined, but in the absence of opercular plates the significance of this difference in a single specimen is doubtful. *B. eburneus* has been found in Pleistocene deposits of the Panama Canal Zone.

Station 9464 (W 151 F). Département de l'Ouest, north edge of Port au Prince, along road leading up to dwelling houses of the Haytian-American Sugar Co. From beds of Miocene age, 75 meters above sea level. One specimen, collected by W. P. Woodring.

Cat. No. 352256, U.S.N.M.

BALANUS CONCAVUS ESEPTATUS, new subspecies.

Plate 1, figs. a, b.

Conic or subcylindric barnacles of moderate size, similar to *B. concavus pacificus* so far as the walls are concerned. The parietes are smooth, radii wide with oblique summits. The parietal tubes

have no transverse septa; they are often wholly filled up in the fossils. In the largest specimens there are about 26 tubes in the rostrum. The basis is densely porose, the pores septate towards the peripheral parts. Many specimens retain part of the color, being pink or clouded with pink. Opercular valves unknown.

Carinorostral diameter 24 mm.; height 18 mm.

This barnacle does not differ in the walls from *B. concavus pacificus*, recent and Pleistocene in southern and Lower California; but as the several subspecies of *B. concavus* differ in the sculpture of the opercular valves, it is quite possible that these, when found, will show differences from the west coast form. At present the special name *eseptatus* is given to the Haitian form. Until the opercular valves can be examined, this seems less likely to lead to error than a provisional identification with the Californian *B. c. pacificus*.

It differs from the Miocene subspecies of *concavus* from the Atlantic coastal plain and the Panama Canal Zone by various features of the walls, especially the entire absence of transverse septa in the parietal pores.

Station 9464 (W 151 F). Département de l'Ouest, north edge of Port au Prince, along road leading up to dwelling houses of Haytian-American Sugar Co. From beds of Miocene age, 75 m. above the sea. Numerous specimens collected by W. P. Woodring.

Type.—Cat. No. 352257, U.S.N.M.

BALANUS POLYPORUS, new species

Plate 1, fig. c.

The walls are somewhat roughened but not ribbed, the radii wide. The parietal tubes are narrow and very numerous, 33 in the rostrum of the type, not transversely septate. The basis is calcareous, and where examined near the edge is not porose.

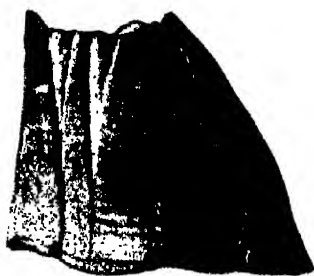
In the type specimen the rostrum is notably longer than the other plates, as in *Membranobalanus*, but this is doubtless merely an accident of station.

Carinorostral diameter 13 mm.; length of rostrum 17 mm.

The numerous narrow and nonseptate tubes of the parietes differentiate this form from known American species; but as the opercular plates have not been obtained, its affinities are uncertain. Like all of the species treated in this paper, it belongs to the typical subgenus of *Balanus*.

Station 9750 (B 358 F). Miocene beds, same locality as 9464. One specimen collected by J. S. Brown.

Type.—Cat. No. 352258, U.S.N.M.



a



b



c

BALANUS CONCAVUS ESEPTATUS AND B. POLYPORUS.

FOR EXPLANATION OF PLATE SEE PAGE 3.

BALANUS AMPHITRITE Darwin.

Two specimens without opercular plates agree with this species, which is abundant in the recent fauna, and has been found in the Caloosahatchie Pliocene.

Station 9480 (K 2 F). Département de l'Ouest, road cut at foot of Morne à Bateau. Age of beds uncertain, possibly Pliocene or Pleistocene, rather than Miocene. W. S. Burbank, collector.

Type.—Cat. No. 352259, U.S.N.M.

EXPLANATION OF PLATE.

FIGS. *a, b*.—*Balanus concavus esepatus*. Lateral view of the type. Rostral view of cotype, cut to show pores. $\times 1\frac{1}{2}$.

c.—*Balanus polyporus*. Lateral view of the type. $\times 1\frac{1}{2}$.

A TERTIARY CRINOID FROM THE WEST INDIES.

By FRANK SPRINGER,

Of the United States National Museum.

In the year 1922 there were submitted to me by Dr. Wendell P. Woodring, of the Haitian Geological Survey, some fragmentary crinoidal remains discovered during a cooperative reconnaissance of the Republic of Haiti, which upon examination proved to belong to the pentacrinid genus *Balanocrinus* Agassiz in Desor. The fossils were derived from strata of early Miocene age in the interior of the island.

The occurrence is of interest as being the second one of this genus recorded from North America, the first having been described by me in 1922 from Tamaulipas, Mexico, as *Balanocrinus mexicanus*, based upon material discovered by Dr. L. W. Stephenson, of the Geological survey.¹ That species, however, is from Upper Cretaceous rocks, so that by the present occurrence the geological range of this European genus in the Western Hemisphere is greatly extended. The known range of *Balanocrinus* in Europe is from Triassic to Miocene, most of the species having been described under the name *Pentacrinus*. The latest occurrence there is in the upper Helvetian of the middle Miocene in Piedmont, Italy, evidenced by stems described by Noelli in 1900 as *Pentacrinus lorioli*,² and referred by Bather to *Balanocrinus* in the Zoological Record for 1900 (p. 143).

The beds in which the crinoid remains under consideration were found belong to the Artibonite formation of the lower Miocene, equivalent to the lower part of the Yaque group of the Dominican Republic. This has been correlated by Cooke and Vaughan with the Burdigalian of the European time divisions.³ A full account by Messrs. Woodring, Brown, and Burbank of the Tertiary stratigraphy of Haiti, containing a notation of the present discovery, will appear in a forthcoming report.⁴

¹ Proc. U. S. Nat. Mus., vol. 61, art. 5, pp. 1-4.

² Contribuzione allo studio dei Crinoidi Tertiari del Piemonte, Atti. Soc. Ital. Sci. Nat., vol. 39, 1900, p. 28, pl. 1, figs. 33, 34. See also Bather, Ann. and Mag. Nat. Hist., ser. 8, vol. 20, Dec. 1917, p. 405.

³ Geological Reconnaissance of the Dominican Republic Memoirs, vol. 1, 1921, pp. 57, 65, and 96.

⁴ Geology of the Republic of Haiti: Republic of Haiti Geol. Survey (awaiting publication).

The history and characters of the genus *Balanocrinus* have been exhaustively discussed by Dr. F. A. Bather, of the British Museum, in connection with a redescription of the two leading species from the middle and upper Eocene of the London clay and the Nummulitic beds of Biarritz, France;⁵ and reference should be had to this important paper for the fullest information upon the subject.

The Haitian material consists of 24 stem-fragments, ranging from a maximum length of 41 mm. down to short pieces of only two or three columnals. The longer pieces from 25 to 41 mm. in length have 9, 10, 11, 12, 14, and 16 columnals, the number 14 being the most frequent. It seems probable that some of these represent complete internodes, or intersyzygia, although in none of them are two terminal syzygial faces perfectly shown. The preservation of the specimens is mostly rather poor, the surfaces being more or less covered with carbonate of iron and the edges at the joints often considerably frayed; but enough remain intact in several instances to disclose the joint faces characteristic of the genus.

Comparison is naturally suggested with the Italian species of nearly equivalent horizon, but in order to establish the record it will be best first to describe the Haitian form as a new species.

BALANOCRINUS HAITIENSIS, new species.

Plate 1, figs. 1-10a.

Known only from stem-fragments. One of the two longest is 41 mm. in length, tapering from 7 to 6 mm. in diameter; composed of 16 columnals averaging about 2.5 mm. in height (fig. 1); this probably embraces a complete internode, of which the terminal ossicles at either end were cirrus bearing, the evidence of which is obscure, but is reinforced by comparison with the syzygial face in some other specimens. Another of nearly the same length (fig. 8) contains 12 columnals 8.5 to 9 mm. in diameter, averaging 3 mm. high, plus a lower one at each end; one of these is clearly the epizygial, having two cirrus-facets at adjacent radii pointing obliquely upward (drawn with this end uppermost for better lighting), and faint indication of a third one opposite to these two; the corresponding columnal at the other end shows indistinct traces of three cirrus facets alternately placed. Two other pieces (not figured), 39 and 35 mm. in height, have 16 and 14 columnals, respectively, of which the terminal faces may be syzygial, thus giving 14 and 12 ossicles to the internode; these terminal ossicles seem rather shorter than the others, but cirrus-facets are not seen. A fifth piece of 33 mm. in length has 14

⁵ British Fossil Crinoids, XI, *Balanocrinus* of the London Clay. Ann. and Mag. Nat. Hist., ser. 8, vol. 20, Dec. 1917, pp. 385-407.

columnals, of which the upper one, with the radial structures much injured by corrosion, may be a nodal, but no facets are visible (figs. 4, 4a). In this specimen it is seen how the radial ridges have been partly decomposed, leaving the petal floors between them prominently preserved. This condition is further shown in Figure 6a, where the ridges are destroyed and the resulting pentamerism is emphasized. In Figures 4, 5, and 6 the effect of weathering and decomposition upon the sides of the stem is shown, producing more or less longitudinal projections, in some rounded and in some angular. Figures 2 and 3 show the distortion of the columnals by crushing.

All the stem-fragments in their normal condition, that is, when unaffected by weathering, crushing, or chemical action, are strictly cylindrical in outline. The slightly quinquelobate aspect on some of the joint faces is due to peripheral abrasion along the weaker radial lines at the edge of the sectors. The stems range from 6 to 9 mm. in diameter, with about 8 mm. preponderating. The side faces are invariably smooth except where injured, as shown in several figures.

Returning, now, to the cirrus-facets, we are fortunate in having one specimen in which they are very plainly shown upon the syzygial face of one of the nodal segments, which I suppose to be the epizygial (figs. 9, 9a). They are three in number, two at adjacent radii and the third directly opposite these two, leaving the space at the intervening radii blank. They stand obliquely to the syzygial face, projecting somewhat from its general level, and their position is marked by obtuse ridges diminishing inward and engaging with corresponding depressions in the apposed face of the contiguous nodal segment. In another specimen, not figured, similar facets of the same number and position are faintly indicated. The two facets shown in Figure 8, with a third one opposite to them obscurely seen but not visible in the figure, are similarly disposed. Therefore upon the concurrent evidence of three specimens it may be fairly assumed that the normal number of cirri in this species is three to a nodal, distributed according to the definite plan described by Doctor Bather in his paper of 1917 (p. 396) as "not (all) adjacent, but one is opposed to the two others, being separated from them on each side by a blank radius . . . symbolized thus:

A b C D e."

He shows how the cirrus-facets alternate upon successive nodals, and the same thing probably happens here, there being, as already stated, some evidence of such an alternation in the facets on the terminal nodals in Figure 8. The cirrus-facets are extremely small compared with the size of the stem, not over half the height of the nodal pair, thus resembling those of the Eocene species, *B. sub-*

basaltiformis as figured by E. Forbes.⁶ They are in marked contrast to those of the enormous cirri of *B. mexicanus*,⁷ in which the cirrus-facets fill almost the entire height of the combined nodals. In none of the specimens is any portion of the cirrus itself preserved.

The normal joint-face in nearly all the specimens is so much decomposed that the details of structure are usually obliterated, but as before there is fortunately one specimen in which these are well preserved, showing distinctly the unmistakable characters of *Balanocrinus* (figs. 10, 10a). The petaloid sectors are thoroughly well marked; the floors, or ligament fossae, are large, obtusely triangular, considerably depressed, or excavate. In each sector there are about 10 peripheral crenellae at right angles to the periphery, with usually another one at either side next to the radius not reaching the periphery, which according to Bather's terminology would be called adradials, thus making 12 crenellae in all; they are short, those which are strictly peripheral being about one-fourth the length of the radius, here again contrasting with those of *B. mexicanus*, in which the length of the crenellae is from one-third to two-thirds that of the radius. On the syzygial face the crenellae are shorter, but apparently somewhat less in number (fig. 9a). In other specimens the narrow radial ridges are conspicuous, straight, apparently separated by the radial canal, but perhaps partly confluent (figs. 4a, 5a). The axial canal is apparently round, and the lumen very small.

The species with which comparison is invited is the one from the later middle Miocene horizon of Italy, already mentioned, *Balanocrinus lorioli* of Noelli. It is described from three stem fragments, of which two are figured, respectively 17 and 8 mm. in length, about 6 mm. in diameter, with 9 and 4 columnals about 2.5 mm. in height. The columns are said to be subpentagonal, and have exteriorly some longitudinal furrows, with one or more rows of small pores alternating with them, some of which may be exposed by weathering. Two normal joint faces are figured, both obscure in details of structure. According to the text each petal has 7 to 10 crenulae (denti) at the periphery. The differences shown by comparison of stem fragments alone are therefore of rather minor importance, not greater than might be found in different parts of the same stem. However, we have to make the best of such evidence as we have, considering the rarity and imperfection of the specimens.

That which does give to our species a very special interest is the fact that its occurrence in the Miocene of the West Indies furnishes

⁶ Monog. Tertiary Echinod., Palacontogr. Soc., 1852, pl. 4, figs. 8, 9, 10.

⁷ Proc. U. S. Nat. Mus., vol. 61, 1922, pl. 1.

a notable addition to the extremely small number of Tertiary crinoids that are known. When we consider the vast extent of Eocene and Miocene sedimentaries of marine origin in Europe, Asia, Africa, Australia, the United States, West Indies, Central and South America, many of them thousands of feet in thickness and richly fossiliferous, abounding in crustaceans, corals, mollusks, and other organisms everywhere associated with crinoids, in ages preceding the Tertiary as well as in the present seas, it is remarkable how few are the remains of crinoids which they have yielded. About 40 species, embraced in 8 or 9 genera, will cover all that have been described, most of them from very imperfect material, such as isolated columnals of pentacrinites and centrodorsals of comatulids, among which are doubtless a number of synonyms. Well-preserved specimens, such as are so frequent in the Jurassic and Cretaceous, are almost unknown in the Tertiary, about all we know of the crinoid life of that age being derived from the fragmentary remains above mentioned, and even these are of rare occurrence.

Of the restricted number of species hitherto known, only a single one has been derived from American rocks, namely, the cup of a small comatulid belonging to the Thalassometrinae from the Eocene of North Carolina, described by Emmons⁸ as *Microcrinus conoideus*. A few other fragmentary remains, not hitherto noted or described, occur in the same beds, and specimens of a species of a comatulid, *Nemaster*, have been found in the Eocene of South Carolina—all fragmentary and extremely rare amid a profusion of other fossils.

Therefore the present species coming from the West Indies is the first stalked crinoid of Tertiary age to be described from the Western Hemisphere. To it will be added another occurrence probably of the same genus, from the island of Tierra del Fuego, which Doctor Bather informs me he will shortly describe.

Recent investigations in the West Indies and Panama⁹ have shown an extraordinary development of marine Tertiary formations, especially in the Haitian and Dominican Republics, which in places aggregate as much as 1,200 to 2,400 meters in thickness, in many places filled with fossils. Yet out of the extensive collections made during these researches and those previously made by other geologists the 24 fragments upon which this species is based, from a single limited locality, represent all the fossil crinoid remains that have been reported from the West Indies and adjacent lands, a region in the waters of which they are now quite plentiful, amounting as thus

⁸ North Carolina Geological Survey, 1858, p. 311, figs. 246, 247.

⁹ Vaughan, T. W., Contributions to the Geology and Paleontology of the Canal Zone, Panama, and geologically related areas in Central America and the West Indies, 1919. Bulletin 103, U. S. National Museum.

far described to 51 species, distributed among 31 genera, of which 12 species, belonging to 8 genera, are of the stalked type.¹⁰

The crinoids existed in the Mesozoic in great profusion, their fossil remains having been found to the number of upward of 400 described species, belonging to more than 40 genera, many of them perfectly preserved and some of cosmopolitan distribution; while in contrast to the scant 40 species known from the Tertiary there are now described from existing seas 576 species of crinoids, belonging to 142 genera, of which 76 species, of 22 genera, are of the stalked variety. The question naturally arises, what became of the crinoids in the meantime?

The scarcity of crinoids in the Tertiary, and the fragmentary condition of their remains, is indeed surprising when compared with their relative abundance in the Jurassic and Cretaceous and also in the recent seas. And yet if the present reefs and beaches were known only in a fossil condition we should find exactly the same state of affairs.

The marine Tertiary sedimentaries are composed chiefly of littoral and reef materials, laid down in shallow seas. The fossils which abound in them belong mostly to organisms of which the hard parts are firmly constructed and capable of enduring the effect of shore action. The crinoids of Cenozoic time, on the other hand, are delicately organized and of fragile construction, so that with a few exceptions like *Holopus* they are broken up with the least disturbance.

When a comatulid dies—and comatulids are extremely sensitive—it at once disintegrates, and the only recognizable portion that remains is the radial pentagon with the controdorsal, or either of the two alone.

The reefs of to-day support a crinoid fauna of approximately 245 species, all of the comatulid type. Most of these are very local, occurring only in a few limited regions, and many are very rare. In the Caribbean region, where in the deeper waters crinoids are often abundant, the shore line records are:

Nemaster grandis A. H. Clark: "Mexico," 1758. *Nemaster iowensis* (Springer): Tortugas, 1893; Bahamas. *Antedon drübenii* Böhlische: St. Thomas, about 1850. *Cenocrinus asteria* (Linnaeus): Barbados, about 1870. *Holopus rangii* D'Orbigny: Barbados, 6 records; ? Bermuda. *Democrinus rawsonii* (Pourtales): Guadeloupe.

A recent reef if fossilized might show, as extremely rare objects confined to a very few closely circumscribed localities, the radial

¹⁰ See Austin H. Clark, 1921. Report on the Crinoids collected by the Barbados-Antigua Expedition from the University of Iowa, in 1918. University of Iowa studies in Natural History, vol. 9, No. 5, pp. 12-14.

pentagons and centrodorsals of comatulids. Such remains have actually been found at Newcastle, New South Wales, Singapore, Taranto, and on the coast of Kent in England.

Not far below the surface in a few widely separated localities live large pentacrinites, *Holopus*, and *Democrinus*.

The crowns of the pentacrinites are almost as fragile as the comatulids, and very soon go to pieces, while the arms of *Democrinus* are extremely fragile, and the column is rather brittle.

Since Dr. W. B. Carpenter reported that once after a hurricane the beach at Barbados was strewn with pentacrinites of all sizes, and 7 of the 11 known specimens of *Holopus rangii* were found on the beach (6 of them at Barbados), and the first known species of *Democrinus* was described from a recent breccia at Guadeloupe containing a human skeleton, it follows that a recent reef if fossil might contain fragments of pentacrinite stems, fragments of *Democrinus* stems, or well-preserved specimens of *Holopus*.

As the foregoing sketch gives a fairly complete survey of what we might expect if the present reefs and beaches were known only as fossil strata, we may hazard the assumption that the scarcity of crinoids in the Tertiary means nothing more nor less than that at that time the crinoids first began to exist chiefly under the conditions delimiting their occurrence at the present time.

Horizon and locality.—Artibonite formation, lower Miocene, Tertiary. Divide on trail between La Chapelle and Mirebalais. Republic of Haiti. Collected by J. S. Brown, December 18, 1920. U. S. Geological Survey loc. No. 9494.

Type.—In U. S. National Museum, Cat. No. 352556.

EXPLANATION OF PLATE.

All figures are enlarged about two diameters.

Balanocrinus haitiensis new species.

Lower Miocene. Island of Haiti.

FIG. 1. The longest stem-fragment, about 41 mm., with a longitudinal row of irregular pits along the radial line due to erosion or chemical action.

FIGS. 2, 3. Specimens showing distortion of the stem produced by crushing, the first having probably a cirrus-facet preserved.

FIGS. 4, 4a. Two views of a stem-fragment with the convex edge of some petals exposed by erosion at the side and top, and at the latter the remnant of what is probably the normal joint-face with the radial ridges much eroded, leaving petal floors rounded and prominent; only faint traces of crenulae remain.

FIGS. 5, 5a. Side and terminal views of a stem-fragment with sides eroded along longitudinal radial lines, leaving the interradian sectors convex; the upper face being possibly a syzygial joint, with obscure traces of cirrus-facets, the radial ridges rounded and their bordering furrows distinctly outlined; some peculiar striae are seen in two of the petal areas.

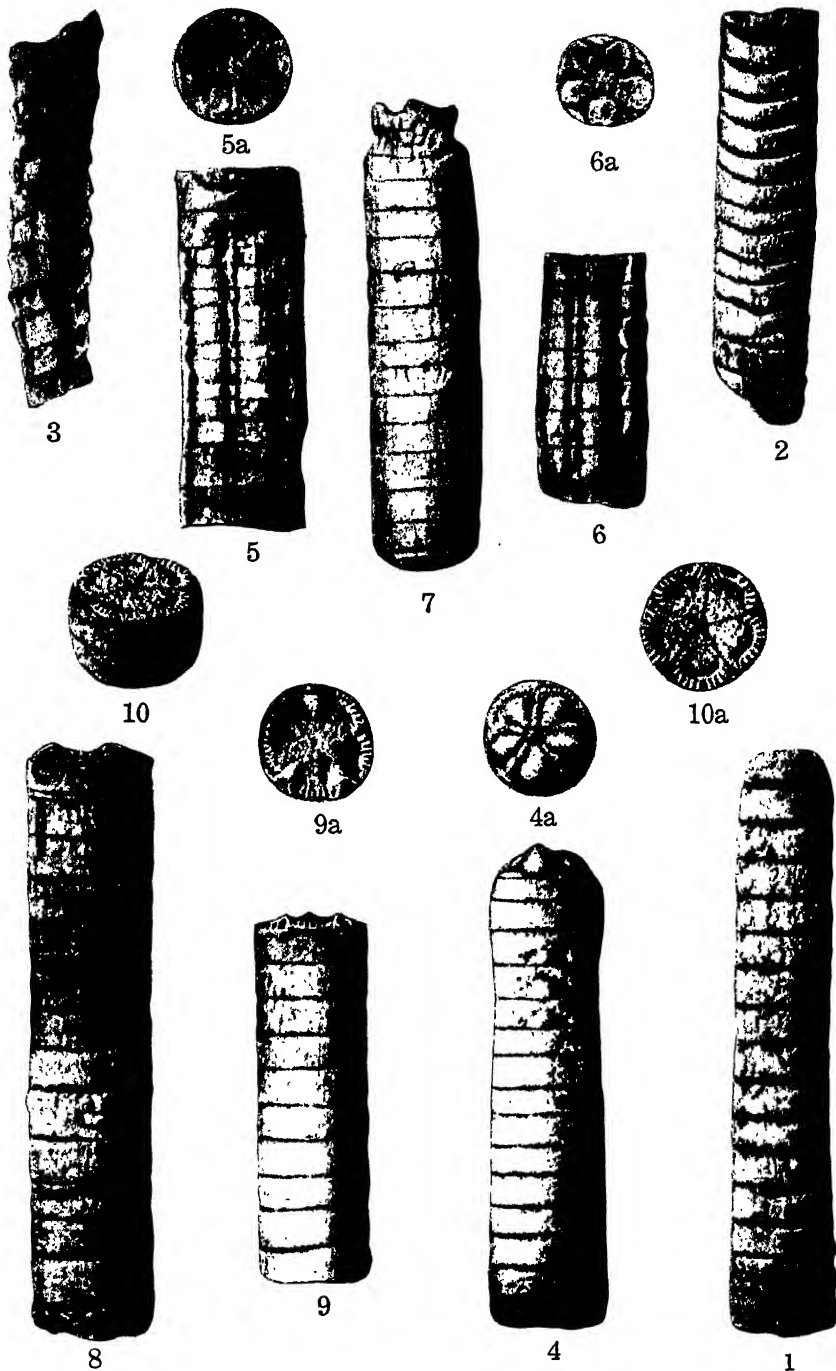
FIGS. 6, 6a. Side and terminal views of a stem-fragment altered somewhat like the last, but in which the radial structures have been destroyed by chemical action, leaving the more substantial petal sectors strongly outlined, but without trace of crenellae.

FIG. 7. A stem with smooth, unaltered sides, except near the upper end, where there is the remnant of a cirrus-facet.

FIG. 8. A smooth stem with probably a nodal columnal at each end. Two cirrus-facets are clearly shown at the upper face, at adjoining radii.

FIGS. 9, 9a. Two views of an unaltered stem-fragment, with the epizygial at the top (so posed in photographing for better lighting of the structures), showing 8 cirrus-facets well preserved, oblique to the general surface, two at adjoining radii, and the third one opposite, leaving the two intervening radii blank. The peripheral crenellae are distinct in some parts of this face, but no trace of radii can be seen upon it.

FIGS. 10, 10a. Two views of a fragment consisting of two columnals, on one of which the normal joint-face is in good condition. The petal floors are depressed, as usual in the genus, the radial ridges slightly elevated between them, indented with faint narrow canals leading to the radial center; the peripheral crenellae are distinct, 10 or 12 in number to the sector, with the outer pair next to the radii slightly receding from the margin.



A NEW TERTIARY CRINOID FROM THE WEST INDIES

FOR EXPLANATION OF PLATE SEE PAGES 7 AND 8

SOME NEW PARASITIC HYMENOPTERA WITH NOTES ON SEVERAL DESCRIBED FORMS.

By A. B. GAHAN,

Of the Bureau of Entomology, United States Department of Agriculture.

In this paper will be found descriptions of nine new species of Chalcidoidea and two new species of Serphoidea together with notes on synonymy, distribution and hosts of several described species. The new species described include one species from Japan and two species from Panama, the remainder being from the United States.

Superfamily CHALCIDOIDEA.

Family ENCYRTIDAE.

PLAGIOMERUS CYANEA (Ashmead).

Omys cyanea ASHMEAD, Ent. Amer., vol. 4, 1898, p. 17.

Eucomys cyanea DALLA TORRE, Cat. Hymen., vol. 5, 1898, p. 239.

Habrolepts cyanea ASHMEAD, Proc. U. S. Nat. Mus., vol. 12, 1900, p. 404.

This species belongs in the genus *Plagiomerus* Crawford and is very similar to the genotype species, *P. diaspidis* Crawford, if not identical with that species.

Only the type specimen is known. This specimen differs from typical *diaspidis* by having the mesoscutum strongly metallic blue in color instead of bronzy black and the hairs of mesoscutum appear paler in color and somewhat more numerous. Otherwise they appear to be alike.

CHEILONEURINUS MICROPHAGUS (Mayr).

Cheiloneurus microphagus MAYR, Verh. zool. bot. Ges. Wien, vol. 25, 1875, p. 745.

Cheiloneurus diaspidinarum HOWARD, Ins. Life, vol. 7, 1894, p. 250.

Aphidencyrtus aspidioti GIRAULT, Ann. Ent. Soc. Amer., vol. 8, 1915, p. 283.

Aphidencyrtus aspidioti, var. *brittanicus* GIRAULT, Entomologist, vol. 48, 1915, p. 217 (female).

Cheiloneurinus microphagus (Mayr) MERCET, Faun. Iber., Encirtidos, 1921, p. 647.

The United States National Museum has recently received through an exchange with Garcia Mercet a female specimen from Fuenterrabia, Spain, determined by Mercet as *Cheiloneurinus microphagus*

(Mayr). Mercet's identification of the species is based upon a supposed Mayr cotype and should be correct, although, as Mercet has pointed out, the cotype differs from Mayr's description in the color of the wings.

As determined by Mercet the species is undoubtedly identical with *Cheiloneurus diaspidinarum* Howard, *Aphidencyrthus aspidioti* Girault, and *Aphidencyrthus aspidioti*, var. *britannicus* Girault.

Howard's description of *Cheiloneurus diaspidinarum* was drawn from two females (only one of which can now be located) reared at Liberty, South Carolina, from *Lepidosaphes ulmi* Linnaeus.

Aphidencyrthus aspidioti Girault was described from three females said to have been reared from *Aspidiotus perniciosus* Comstock at Lansing, Michigan. Only the type slide bearing a single female has been located. The variety *britannicus* was described from three females, two of which are in the National Collection on a single slide, and which were reared at Manchester, England, by A. D. Imms from *Lepidosaphes ulmi*.

In connection with the description of *Aphidencyrthus aspidioti*, var. *britannicus*, Girault mentioned specimens which he stated were apparently the males. Two slides bearing the name in Girault's handwriting and data similar to that of the type are in the national collection and undoubtedly constitute the material referred to by Girault. Both specimens are males of *Anabrolepis zetterstedti* (Westwood) and will be further discussed under that species.

Besides the specimens already mentioned, the national collection contains eight card mounted females from the same source as the type material of Girault's variety *britannicus* but not part of the type material and three females labeled "Par. of *Mytilaspis* sp. and *Aspidiotus spurcatus*, Pontvalains, Sarthe, France (P. Marchal)." Also a single female reared from the rose scale (*Diaspis rosae*) from Stanford University, California, by R. W. Doane.

ANABROLEPIS ZETTERSTEDTII (Westwood).

Encyrtus zetterstedtii WESTWOOD, Philos. Magaz., vol. 10, 1837, p. 440.

Habrolepis zetterstedtii MAYR, Verh. zool. bot. Ges. Wien, vol. 25, 1875, p. 752.

Habrolepis zetterstedtii ASHMEAD, Proc. U. S. Nat. Mus., vol. 12, 1900, p. 404.

Aphidencyrthus aspidioti, var. *britannicus* GIRAULT, The Ent., vol. 48, 1915, p. 217 (male, in discussion).

Aphidencyrthus aspidioti GIRAULT, Psyche, vol. 24, 1917, p. 95 (misidentification of male).

Anabrolepis zetterstedtii TIMBERLAKE, Proc. Haw. Ent. Soc., vol. 4, 1920, p. 432.

Habrolepis zetterstedtii GIRAULT, Proc. U. S. Nat. Mus., vol. 58, 1920, p. 189.

Habrolepis zetterstedtii MERCET, Fauna Iberica, Himenopteros, Fam. Encyrtidos, 1921, p. 678.

Two females determined by J. C. Crawford as this species are in the National Museum, reared by A. D. Imms at Manchester, England, from *Lepidosaphes ulmi* (Linnaeus). I can see no reason to doubt the correctness of the determination. These specimens were apparently reared from the same material as were the types of *Aphidencyrthus aspidioti*, var. *britannicus* Girault, which species (as represented by the female type) has been shown to be a synonym of *Cheiloneurinus microphagus* (Mayr) (ante p. 2). Two males from the same source which are in the National Museum and which were described by Girault as apparently the males of his var. *britannicus* are, however, undoubtedly males of *Anabrolepis zetterstedtii* instead. Four females in the National Collection labelled "Par. of *Mytilaspis* sp. & *Aspidiotus spurcatus*, Pontvalains, Sarthe, France, P. Marchal" and which have been previously determined, apparently by Ashmead, as *Habrolepis dalmani* (Westwood) are not that species but belong, in my opinion, to the present species.

The species has been recorded from North America by Ashmead (1900) and again by Girault. Ashmead did not indicate the source of his specimens, which have not been located. Girault (1917) recorded two males reared from *Lepidosaphes ulmi* at Monmouth, Maine, under the name of *Aphidencyrthus aspidioti*. Again (1920) he recorded a female from the same host and locality under the name *Habrolepis zetterstedtii*. Girault's specimens, like those of Ashmead, are missing, but there can be little doubt that the males referred to in the first reference are really the same species as the female subsequently recorded, and the identification of the female was probably correct.

In addition to the above records the writer has seen two females labeled as having been reared at Columbus, Ohio, by Robert A. Young from *Diaspis ostreaeformis*. These bear the name label *Habrolepis dalmani*, but appear to be *zetterstedtii*. A single male specimen was recently received from J. McDunnough, of the Canadian Department of Agriculture, and which was reared at Vernon, British Columbia, from *Lepidosaphes ulmi*.

Timberlake (1920) has transferred the species to his new genus *Anabrolepis*, where it apparently belongs.

Family EUPELMIDAE.

Genus LECANIOBIUS Ashmead.

Lecaniobius ASHMEAD, Proc. Ent. Soc. Wash., vol. 4, 1896, p. 17.

Zalophothrix CRAWFORD, Proc. Ent. Soc. Wash., vol. 9, 1908, p. 156.

Female.—Head viewed from above strongly transverse, as wide as or wider than the thorax; occiput immargined; posterior orbits rather narrow and receding from the eye-margin; ocelli distant from

the eye and arranged in a low triangle; front ocellus above the antennal groove; viewed from in front the head is broader than high, antennae inserted a little below the lower extremities of the eyes, widely separated at base, the antennal grooves deep and carinately margined, converging above but not confluent being separated above by a sharp carina; lateral margins of the antennal grooves higher than the inner margins and forming, laterad of the antennal fossae, a prominent ledge which curves outward to meet the eye-margin at or near the lower extremity of eye; scape reaching to the front ocellus, curved; flagellum gradually increasing in thickness from pedicel to club; the club obliquely truncate; eyes moderately large, and very faintly pubescent; mandibles tridentate; mesoscutum concave behind, the lateral lobes longitudinally carinate posteriorly; axillae narrowly separated; scutellum convex, rounded behind with a distinct median longitudinal crest of black bristles; marginal vein shorter than the submarginal; stigmal and postmarginal subequal and each approximately one-third as long as marginal; disk of forewing densely ciliated with a transverse fuscous band; front femora distinctly swollen, subtriangular in outline, broadest between middle and apex; middle femora broad, concave beneath; middle tarsi moderately swollen and spined beneath; hind femora not much swollen, their tibiae compressed into a sharp carina behind and bicalcarate; abdomen ovate, not longer than the thorax, the tergites not incised at apex and the ovipositor not or barely exerted.

Male.—Unknown.

The above generic description is drawn from the Ashmead and Crawford types and the new species described below. Only two species are known, *cockerelli* Ashmead and the new species. Both species are, so far as known, neotropical in distribution. Crawford¹ has already pointed out that his species, *Zalophothria mirum*, is a synonym of *Lecaniobius cockerelli* Ashmead.

LECANIOBIUS CAPITATUS, new species.

This species is at once distinguished from *cockerelli* by the fact that the head, as viewed from in front, is not nearly twice as broad as high, although distinctly broader than high; the area between the inner eye-margin and the margin of scrobe is nearly as broad at the lower extremity of the eyes as at the upper angle of the scrobe instead of much narrowed below; in dorsal aspect the head is more strongly transverse, the frons much less flattened and more nearly perpendicular; the antennal scape is longer, about six times as long as thick; the general color is much darker.

Female.—Length 2.75 mm. Head finely and nearly uniformly shagreened and with conspicuous white pubescence, except on the

¹ Proc. U. S. Nat. Mus., vol. 41, 1911, p. 275.

cheeks and behind the eyes, where the sculpture is more reticulate and the pubescence confined to the upper portion being especially dense along the eye-margin; whole mesoscutum strongly pubescent, the median lobe densely punctate, lateral lobes on outer face a little less strongly sculptured, and the concave posterior portion rather weakly sculptured; scutellum very finely reticulated and opaque and for the most part without pubescence; axillae opaquely punctate and pilose; propodeum weakly sculptured and without pubescence except at the lateral angles which are pilose; mesopleura with fine shallow sculpture, destitute of pubescence on the greater part of the mespimeron but strongly pubescent anteriorly and ventrally, with an oblique stripe of very dense white pile extending from beneath the anterior wings to the front coxae; legs conspicuously hairy, the hind coxae outwardly above and below densely clothed with white pile; abdomen weakly sculptured all over, bare above but conspicuously hairy beneath. Head black with a slight bluish metallic tinge on frons, the lower part of face and cheeks and the antennal grooves within ferruginous; scape ferruginous, the flagellum brownish black, more or less tinged with ferruginous beneath; thorax mostly black, faintly tinged with bronzy above, more strongly metallic beneath; prothorax, except sternum, ferruginous; scutellum brownish ferruginous at base; legs bronzy black, the anterior and middle trochanters and femora beneath and the front tibiae on the inner side more or less dark ferruginous, the middle femora above with a white spot at the anterior apical angle; middle tibial spur pale ferruginous; all tarsi dark brown, spines on under side of middle tarsi black; forewing medially with a broad blackish transverse band of dark colored cilia which is margined proximally and distally by a narrow contrasting border of white cilia; basad of this band the wing is hyaline except for an elongated patch of dense dark cilia extending obliquely distad and caudad from the base of the submarginal vein but terminating before reaching the median transverse band; apical one-third of wing fusco-hyaline; hind wings entirely hyaline; abdomen bronzy black, purplish at base; exserted tip of ovipositor yellowish-brown.

Male.—Unknown.

Type-locality.—Las Sabanas, Panama.

Type.—Cat. No. 24990, U.S.N.M.

Type and one female paratype reared from a wax scale, *Ceroplastes*, species, collected at Las Sabanas, Panama, by J. Zetek and I. Molino in June, 1921, and bearing their number Z-1502.

These type specimens were evidently reared from the same lot of scale insects as was the type of *Eupelmus cocdivorus* Gahan, described herewith. Four male Eupelmines evidently from the same material were received, also. Owing to the great amount of antigeny

existing in this group I have found it impossible to definitely associate these males with either species and consequently have refrained from describing them until their identity can be more certainly established.

EUELMUS COCCIDIVORUS, new species.

This species resembles closely the description and figure of *E. saissetiae* Silvestri² and apparently has the same habit of attacking scale insects, but it may be distinguished by the fact that the ovipositor is much less strongly exerted, and is not dark at tip, the wings appear to be less strongly infumated, the legs are somewhat differently colored and the first tergite seems to be much more deeply incised at apex.

Female.—Length 2.75 mm. Head strongly sculptured, the face and cheeks with conspicuous silvery white pubescence; viewed from above, thick antero-posteriorly, twice as broad as long and as broad as the thorax at tegulae; occiput immargined; frons above the scrobes flattened, narrowest at the apex of scrobes where it is narrower than behind the posterior ocelli; ocelli in an equilateral triangle, the ocellocular line equal to the diameter of an ocellus; viewed from in front, the head is slightly broader than high, subtriangular with the vertex nearly straight and the sides and cheeks rounded; antennal grooves deep and sharply defined, confluent above, separated below by a triangular plate which is sharply defined laterally and extends upward more than half the length of scrobes; front ocellus less than its own diameter above apex of scrobes, the latter more finely sculptured within than the remainder of head; eyes nearly circular and covered with very short inconspicuous pile; malar space approximately as long as the rather short scape; scape distinctly shagreened and about four times as long as broad; pedicel approximately two and one-half times as long as its apical breadth, very slightly longer than the third and fourth joints combined; third joint small, about twice as broad as long and about half as long as the fourth; fifth and sixth joints each longer than the fourth and longer than broad; seventh subquadrate; eighth to tenth inclusive slightly broader than long; club 3-jointed, subovate and about as long as the three preceding joints combined. Thorax pubescent, less strongly sculptured than the head, the mesepimeron finely lineolate-reticulate and destitute of pubescence; axillae narrowly separated at base; propodeum laterally and the hind coxae outwardly, except a triangular area down the middle, densely clothed with conspicuous white pubescence; marginal and submarginal veins subequal, post-marginal longer than stigmal, the submarginal with about eleven or twelve stiff bristles dorsally; wings more than ordinarily densely

² Boll. Lab. Zool. Agr. Portici, vol. 9, 1913, p. 289.

ciliated on the disk; abdomen about as long as head and thorax, pubescent, the first tergite deeply emarginate at the middle, the second to fifth tergites less deeply so; ovipositor visible from above for a length about equal to the last joint of hind tarsus. Head metallic bluish-green, tinged with coppery on the frons and vertex; antennae black, the scape and pedicel tinged with bronzy; mandibles dark brown with their apices black; palpi pale; thorax mostly bluish-green with a coppery tinge, the scutellum and axillae coppery and the mesepimeron for the most part blackish; abdomen brownish black with coppery and greenish reflections; forewings subhyaline, with the discal ciliation basad of the union of marginal and submarginal veins pale, the ciliation distad of base of marginal vein darker and giving a faint dusky tinge to the wing; all coxae concolorous with the thorax; front legs pale yellowish, except a large brownish or somewhat coppery spot on the apical half of femora beneath; middle legs yellowish with their femora and tibiae more or less fuscous; hind femora, except a pale line along dorsal margin, and the hind tibiae, except at apex, brownish; apical two or three joints of all tarsi brownish; spines on underside of middle tarsi black; ovipositor sheath blackish basally, pale yellowish apically.

Type-locality.—Las Sabanas, Panama.

Type.—Cat. No. 26175, U.S.N.M.

Type, a female reared from a wax scale, *Ceroplastes*, species collected at Las Sabanas, Panama, by J. Zetek and I. Molino in June, 1921, and bearing their number "Z-1502." A single female paratype is said to have been reared from *Saissetia nigra* Nietner taken at Ancon, Canal Zone, by Mr. Zetek.

Family APHELINIDAE.

APHELINUS SANBORNIAE, new species.

Very similar to *mali* Haldeman but may be distinguished at once by the entirely black abdomen. The forewing basad of the hairless streak bears fewer hairs in the angle behind the marginal vein than does the wing of *mali*, the front tibiae are largely black or at least blackish basally and the ovipositor does not protrude beyond apex of abdomen.

Female.—Length, 0.8 mm. Head and thorax smooth and polished; eyes hairy; antennae rather short, six-jointed; the scape spindle-shaped and approximately as long as the pedicel and three funicle joints combined; pedicel about twice as long as broad at apex and not quite as long as the entire funicle; first two funicle joints subequal and each approximately twice as broad as long; third funicle joint distinctly shorter than the pedicel but hardly one and one-half times as long as broad; club approximately equal to the scape in

length; forewing distad of hairless streak thickly ciliated, basad of hairless streak with a single obliquely transverse row of hairs bordering the streak and from three to six similar hairs in the angle formed by the marginal vein and the transverse row of hairs; abdomen triangular, smooth and polished; ovipositor barely visible at apex. Head, thorax, and abdomen shining black; antennal flagellum pale orange yellow, the scape black; legs black with the extreme base and apex of anterior and middle tibiae very narrowly, the hind femora entirely and all tarsi, except at apex, pale yellow; wings hyaline.

Male.—Agrees with the female except that the third funicle joint is distinctly longer and thicker than the pedicel, about equal in length to the pedicel and first two funicle joints combined; the scape on the ventral side has three small round tubercle-like sensoria or glands which are visible only in slide mounts under high magnification; and the abdomen is shorter and less distinctly triangular.

Type-locality.—Spring Mills, Pennsylvania.

Type.—Cat. No. 26176, U.S.N.M.

Host.—*Sanbornia juniperi* Pergande.

Described from four females and one male reared by E. A. Hartley, September 16, 1921, from the above named aphid. Antenna of allotype male and wing of a female paratype on one slide and antenna of female paratype on another.

APHELINUS JUCUNDUS, new species.

Resembles *semiflavus* Howard but may be distinguished by the yellow face and somewhat shorter third funicle joint. Also resembles *howardi* Dalla Torre but differs from the description of that species in the more extensive and differently arranged ciliation of the forewing.

Female.—Length, 1.2 mm. Frons, mesoscutum and scutellum distinctly finely shagreened; the frons nearly opaque; mesoscutum pubescent and more or less shining; propodeum very finely transversely rugulose; abdomen nearly smooth; mesopleura weakly sculptured and shining; hind coxae polished. Eyes hairy; antennal scape slender and approximately as long as the funicle and club combined; pedicel about one and one-half times as long as broad; first two funicle points each about twice as broad as long; third funicle joint subquadrate; club subequal to the combined pedicel and funicle; marginal vein of forewing as long as the submarginal; discal ciliation basad of the hairless streak considerably coarser than that distad, and covering the whole area behind the marginal vein, with a few hairs also in the area behind the submarginal; abdomen ovate, as long as the thorax, the ovipositor slightly exerted. Vertex, frons above, posterior orbits, more or less of cheeks, occiput,

entire thorax, and middle and hind coxae, black; abdomen, except at base, blackish or piceus; antennae entirely, lower part of frons, face, more or less of cheeks, front coxae, all femora, tibiae and tarsi and transverse band at base of abdomen pale yellowish; wings subhyaline.

Male.—Unknown.

Type-locality.—Whittier, California.

Type.—Cat. No. 26177, U.S.N.M.

Host.—*Macrosiphum solanifolii* Ashmead.

Described from nineteen card-mounted and five slide-mounted specimens, apparently all females, reared from the potato aphid by H. Compere, February 20, 1922, and received by the Bureau of Entomology from H. M. Armitage. Also two females taken at the same place by E. A. Hartley, who first called the writer's attention to this form.

APHELINUS AUREUS, new species.

Agrees very closely with *automatus* Girault but differs in its beautiful bright orange color and in having the scutellum and posterior half of the mesoscutum reticulated instead of shagreened.

Female.—Length, 1 mm. Pedicel barely as long as thick; first and second funicle joints small and transverse; third funicle joint subquadrate; club approximately four times as long as the penultimate joint and somewhat thicker than usual. Mesonotum anteriorly granular, the posterior half and the scutellum reticulate, the areas hexagonal or pentagonal and rather large; forewings moderately broad, the marginal and submarginal veins subequal, disk of wing distad of the hairless streak with moderately dense ciliation; basad of the hairless streak with very sparse coarse cilia; abdomen oval with the exerted portion of the ovipositor sheaths about equal in length to the hind metatarsus. Eyes and ocelli dark; head, thorax and abdomen bright orange or golden yellow but with a narrow median line on the mesoscutum and scutellum and the sutures for the most part paler; wings hyaline; the venation and the legs concolorous with the body or only slightly paler.

Male.—Similar in every way to the female except that the abdomen is somewhat shorter.

Type-locality.—Santa Paula, California.

Type.—Cat. No. 26178, U.S.N.M.

Host.—*Chaitophorus salicicola* Essig.

Described from a single female and two males mounted on slides and reared by E. O. Essig from the above named host.

The writer at first determined these specimens as *automatus* Girault but after a study of all the species in the National Collection is now convinced that they should be held distinct.

APHELINUS PERPALLIDUS, new species.

This species differs from all of the other yellowish North American species except *aureus* Gahan and *automatus* Girault by having the ciliation of the forewing basad of the hairless line very sparse and coarse. It differs from both *aureus* and *automatus* by having the first and second funicle joints not transverse but each about as long as broad, the third funicle joint a little longer than broad, and the ovipositor not at all exerted.

Female.—Length, 0.9 mm. Antennal club not much thicker than the third funicle joint and about four times as long as that joint; eyes bare or practically so; frons, mesonotum and scutellum distinctly finely shagreened; marginal vein of the forewing slightly shorter than the submarginal or subequal to it; discal ciliation of forewing distad of the hairless line moderately dense and short; basad of the hairless line sparse and irregular, scattered over most of the area behind the marginal vein and much coarser and longer than the cilia beyond the hairless line. Body above very pale greenish yellow; beneath and including all legs nearly white; wings hyaline; venation pale yellowish; antennae pale.

Male.—Agrees with female in every way except for the sexual apparatus.

Type-locality.—Sioux City, Iowa.

Type.—Cat. No. 26179, U.S.N.M.

Described from five females and two males reared by C. N. Ainslie from an aphid on elm. Type female, two paratype females and a broken paratype male card-mounted. Allotype male and three paratype females mounted in balsam.

APHELINUS MALI (Haldeman).

Eriophilus mali HALDEMAN, Penna. Farm. Journ., Aug., 1851, p. 131.

Aphelinus mali HOWARD, Rept. U. S. Com. Agr. (1880), 1881, p. 356.

Aphelinus varicornis GIRAULT, Psyche, vol. 16, 1909, p. 29.

Three cotype specimens of *varicornis* Girault mounted on slides are in the National Collection and apparently differ in no way from specimens of *mali* Haldeman. The wings show no more infuscation than do those of *mali*, and the ciliation of the forewing proximad of the hairless streak is practically the same despite Girault's statement to the contrary.

APHELINUS SEMIFLAVUS Howard.

Aphelinus semiflavus HOWARD, Ent. News, vol. 19, 1908, p. 367.

Aphelinus brevipennis GIRAULT, Descriptions Stellarum Novarum, 1917, p. 18.

Types of both the above named species are in the National Collection and have been compared. Except for the abbreviated wings, the types of *brevipennis* differ in no way from typical *semiflavus*.

That this difference is not of specific value is apparent from an examination of the 20 specimens constituting the original type series of *semiflavus*. In this series the size of wings vary from normal to scarcely half normal size. The same tendency to vary is shown by a series of specimens reared from *Myzus persicae* Sulzer at Columbus, Ohio, by E. A. Hartley and the same tendency is shown by the three specimens constituting the type series of *brevipennis*. Both sexes show the same tendency to vary in the size of the wings but the reduction is apparently carried to a greater extreme in the male.

In addition to a large number of specimens reared from *Myzus persicae* the National Collection possesses a male and female of this species reared from *Myzus*, species on *Aquilegia*, at Lafayette, Indiana, May 7, 1916, by J. J. Davis.

APHELINUS LONGICLAVAE Mercet.

Aphelinus longiclavae MERCET, Assoc. Espan. Prog. Ciencias (sep.), 1911, p. 14.

Aphelinus capitis RUST, Ent. News, vol. 26, 1915, p. 73.

This species was originally described as a parasite of *Aspidiotus hederae* Vallot in Spain. *Aphelinus capitis* was described from California where it was said to parasitize a number of different species of scale insects including *Aspidiotus hederae*. While no European specimens of *longiclavae* have been seen by the writer two cotypes of *capitis* together with three other California specimens reared by E. O. Essig from *Aspidiotus hederae* have been compared with Mercet's description and seem to agree so perfectly that I have no hesitation in declaring Rust's species to be a synonym.

APHELINUS CHRYSOMPHALI Mercet.

Aphelinus chrysomphali MERCET, Bol. Real. Soc. espan. Hist. Nat., 1912, p. 135; Trab del Mus. de Cien. Nat. de Madrid, 1912, No. 10, p. 67.

Five slide-mounted specimens reared from *Aspidiotus destructor* Signoret on coconut palm at Rio Pedras, Porto Rico, October 17, 1921, by G. N. Wolcott, have been determined by the writer as this species. The record is interesting as constituting the first identification of this European species from the Western Hemisphere.

APHELINUS ASHMEADI, new name.

Aphelinus howardii ASHMEAD, Trans. Ent. Soc. London, 1900, p. 264 (not *howardii* DALLA TORRE, Cat. Hymen., vol. 5, 1898, p. 221).

This species was described from a single male specimen from the island of Grenada, West Indies. The type is in the British Museum. If really an *Aphelinus* the species should be easily recognized by the unusually long male antennae.

APHELINUS MARLATTI (Ashmead).

Baeocharis marlatti ASHMEAD, Kans. Agri. Exp. Sta. Bull. 3, 1888; Appendix, p. v.

Aphelinus subapterus GIRAULT, Ent. News, vol. 27, 1916, p. 405.

Both of the above-cited descriptions are based upon the same three identical specimens. The Ashmead description was apparently unknown to Girault. In addition to the three specimens mentioned as types by both authors the National Collection now contains two other specimens acquired by gift from the Kansas State Agricultural College in 1920, and which were reared by Mr. Marlatt at the same time and from the same source as were the types. Two of the type specimens have been mounted on a slide and ground to fragments beneath the cover-glass by Girault. The actual type specimen is mounted on a card point in good condition except for loss of both antennae, and the pin bears a label on one side of which is written the Ashmead name and on the reverse side the Girault name.

COCCOPHAGUS LECANII (Fitch).

Platygaster lecanii FITCH, 5th Rept. Ins. New York, 1858, p. 25.

Coccophagus lecanii SMITH, Amer. Nat., 1878, p. 661; Seventh Rept. State Ent. Ill., 1878, p. 130.

Coccophagus ater HOWARD, Rept. Ent. U. S. Dept. Agri., 1880, p. 359.

Coccophagus cognatus HOWARD, Rept. Ent. U. S. Dept. Agri., 1880, p. 359.

Coccophagus flavoscutellum ASHMEAD, Florida Agri., vol. 4, 1881, p. 65.

Coccophagus vividus HOWARD, Bull. 5, Bur. Ent. U. S. Dept. Agri., 1885, p. 25.

With the exception of *flavoscutellum* Ashmead and *cognatus* Howard the above synonymy is that given by Doctor Howard in his Revision of the Aphelininae of North America.

The writer recently had occasion to compare the types of *Coccophagus lecanii* (Fitch), *C. cognatus* Howard, and *C. flavoscutellum* Ashmead, all of which are in the National Collection. After careful comparison and study the conclusion was reached that all three names refer to the same species. Fitch's species is slightly variable as to the extent of the yellow marking on the scutellum and both Howard's and Ashmead's types fall well within the range of this variation and can not be distinguished from *lecanii* otherwise.

The species attacks a long list of Lecaniine and other scale insects and is widely distributed, having been recorded from Europe by Masi³ and others; from Japan by Nakayama;⁴ from Hawaii by Fullaway⁵ and in America it is known to occur from the Atlantic to the Pacific and from Florida to Ontario, Canada, as well as in several of the West Indian Islands.

³ Boll. Lab. Zool. Portici, I, 1907, p. 239.

⁴ Philippine Journ. Sci., vol. 18, 1921, p. 98.

⁵ Proc. Hawaiian Ent. Soc., vol. 4, 1920, p. 242.

COCCOPHAGUS OCHRACEUS Howard.

Coccophagus ochraceus HOWARD, U. S. Dept. Agr., Div. Ent., Bull. 1, 1895, p. 38.

Coccophagus bifasciaticorpus GIRAULT, Soc. Ent., vol. 31, 1916, p. 44.

Types of both the above named species are in the National Collection and are identical in every way. The species is rather easily recognized by reason of its conspicuous dark markings, a large blotch at the middle of pronotum, the entire propodeum, a transverse band on the abdomen sometimes embracing the whole apical half of abdomen being black or blackish and the axillae usually dark brownish. The praescutum is uniformly and closely set with rather coarse hairs, but lacks paired setae except for one pair at the posterior margin just in front of the scutellum; the scutellum has three pairs of setae and is otherwise bare; the female antennae are distinctly clavate, the club distinctly thicker than the funicle and subequal to it in length; the first funicle joint although the smallest joint is somewhat longer than broad, while funicle joints two and three are subequal and each about as long as the pedicel. None of the funicle joints in the female are strongly corrugated. The male is like the female except that the antennae are much longer, the first funicle is the thickest joint, the following joints successively diminishing in thickness and all of the flagellar joints are strongly corrugated.

The types of *ochraceus* were from Alameda County, California, reared from *Lecanium*, species on *Adenostema fasciculatum*. The types of *bifasciaticorpus* were from Cape Town, South Africa, reared from *Lecanium hemisphaericum* Targioni. In addition to the type material the writer has seen specimens from Berkeley, California, sent in by E. O. Essig and from Queenstown, South Africa, collected by E. M. Rust and sent in by Harold Compere, all of which are said to have been reared from *Saissetia oleae* Bernard.

Coccophagus javensis Girault is very similar to this species but differs in that the joints of the funicle in the female are all subequal in length and thickness and not narrower than the club which tapers gradually from base to apex and all of the flagellar joints are strongly corrugated. The propodeum is not as dark as in *ochraceus* although more or less fuscous and the axillae are not darker than the scutellum.

ANERISTUS CEROPLASTAE Howard.

Aneristus ceroplastae HOWARD, Can. Ent., 1895, vol. 27, p. 351.

Aneristus ceroplastae HOWARD, Psyche, vol. 7, 1896, suppl. p. 18.

Coccophagus orientalis HOWARD, Proc. U. S. Nat. Mus., vol. 18, 1896, p. 633.

Aneristus orientalis GIRAULT, Bull. Brooklyn Ent. Soc., vol. 12, 1917, p. 88.

Proccophagus orientalis TIMBERLAKE, Proc. Ent. Soc. Haw., vol. 3, 1918, p. 404.

The types of *Aneristus ceroplastae* and *Coccophagus orientalis* have been carefully compared with the result that the writer is of

the opinion that they are the same species. The former was described from specimens parasitic on *Ceroplastes euphorbiae* Cockrell in Jamaica and the latter from specimens reared from *Ceroplastes actiniformis* Green as well as several other species of scale insects in Ceylon.

The species is apparently widely distributed, the national collection containing material from Hawaii; Los Banos, Philippine Islands; St. Croix, Virgin Islands; and Ancon, Canal Zone, in addition to the type localities.

PROSPALTELLA DIASPIDICOLA Silvestri.

Prospaltella diaspidicola SILVESTRI, Reale Accad. dei Lincei, vol. 18, 1909, p. 564.

Prospaltella niigatae NAKAYAMA, Philippine Journ. Sci., vol. 18, 1921, p. 99, pl. 1, fig. 2.

The National Collection contains several slide mounted cotypes of *diaspidicola* Silvestri received from the author through Dr. L. O. Howard. A single slide-mounted cotype of *niigatae* Nakayama is also in the collection. These cotypes have been compared and seem to be identical. The former name was proposed for specimens of a parasite reared from *Aulacaspis pentagona* (Targioni) from South Africa and the latter for a parasite of the same scale in Japan.

The National Collection also contains three slides bearing a large number of specimens said to have been parasites on mulberry scale, Gifu, Japan, reared by U. Nawa, January 30, 1899. The mulberry scale mentioned was doubtless *Aulacaspis pentagona*. One slide in the collection bears two specimens reared from *Aulacaspis pentagona* at Campinas, Brazil, by F. Noack.

This species is quite similar to *berlesei* Howard, but apparently differs by having smaller wings with the marginal fringe a little more than half as long as the greatest wing breadth; the praescutum bears only two pairs of chaetae, the anterior pair being situated approximately midway between the anterior and posterior margins and about as far from each other as from the lateral margins, the posterior pair located just in front of the scutellum; the first dorsal segment of the abdomen is distinctly reticulated at base.

ENCARSIA FORMOSA, new species.

This species belongs to the *luteola* group in which the middle tarsi are 4-jointed, the fourth and fifth joints being connate. It differs from *luteola* Howard by having the dorsum of the thorax distinctly, almost opaquely, sculptured, and it is also to some extent darker in color. May be distinguished from *quaintancei* Howard by the wholly black scutellum.

Female.—Length 0.6 mm. Antennae rather long and cylindrical; pedicel longer than the first funicle joint, the latter approximately

one and one-half times as long as thick; second, third, and fourth joints subequal and each slightly more than twice as long as thick; club 2-jointed, the joints subequal and each about as long as the fourth funicle joint; occiput distinctly sculptured and the vertex more finely so; mesoscutum, scutellum, and axillae, when viewed through a binocular microscope, with distinct, fine, nearly granular sculpture (mounted in balsam and under a compound microscope this sculpture is seen to be a fine reticulation, the enclosed areas on the middle of the scutellum compressed from the sides and forming elongate longitudinally arranged cells, while elsewhere on the scutellum, as well as on the mesoscutum and axillae, the enclosed areas are irregular and not especially compressed); forewings with the discal ciliation nearly uniform over the whole surface except caudad of the submarginal vein where they are for the most part bare; marginal cilia longest at the posterior apical border of the wing; marginal vein a little longer than the submarginal, the stigmal strongly curved; middle tibial spur about half as long as the basal joint of tarsus; middle tarsi 4-jointed, the fourth and fifth joints connate but with a slight constriction, indicating the original separation; abdomen a little longer than the thorax; rounded at apex, and apparently sculptureless; ovipositor slightly extruded. Antennae, legs, and abdomen pale yellow or nearly white, the antennae very slightly infuscated; face, cheeks, and posterior orbits black; frons, more or less of the vertex, and the occiput above very dark orange yellow or brownish; thorax dull black, with the groove separating axillae from mesoscutum faintly brownish; wings hyaline, venation fuscous; hind coxae blackish at base.

Male.—Length 0.6 mm. Antennal pedicel not much longer than broad, much shorter than the first funicle joint which is more than twice as long as thick, about as long as the second funicle joint and somewhat thicker; second, third, and fourth funicle joints and the basal joint of club subequal in length and breadth, about three and one-half times as long as thick; apical joint somewhat shorter; all funicle and club joints with distinct, widely separated, longitudinal striae; structure and sculpture otherwise like the female. Head mostly brownish yellow, darker on the cheeks and below the antennae; thorax blackish with the mesonotal grooves pale yellowish and the abdomen mostly blackish with sutures somewhat yellowish; antennae and legs as in the female.

Type-locality.—Twin Falls, Idaho.

Type.—Cat. No. 26180, U.S.N.M.

Described from five females and one male mounted on a single slide and received from Ralph H. Smith who is authority for the statement that they are parasitic upon Aleurodidae infesting the leaves of the house geranium; also four females received from A.

Franklin Shull of Ann Arbor, Michigan who states that they were suspected of parasitizing the "common white-fly." Three of the latter specimens mounted on card points, the other one in balsam.

Since the above description was drawn up additional specimens of this species have been received as follows: a large series from Wooster, Ohio, reared by J. S. Houser from pupae of *Trialeurodes vaporariorum* (Westwood) in a greenhouse, February 5, 1923; a large number of specimens reared March 8, 1923, from pupae of the same Aleurodid taken in a greenhouse on the Department of Agriculture grounds at Washington, D. C., by W. H. White.

The host insects from which the type specimens came were not definitely determined but in all probability they were the same species which served as host for the Ohio and District of Columbia specimens.

The parasitized Aleurodid pupae turn black in color and are easily distinguished from healthy pupae which are greenish. The parasite was reported as extremely abundant in both the Wooster, Ohio, and Washington, D. C., infestations.

Family PTEROMALIDAE.

RHOPALICUS PULCHRIPENNIS (Crawford).

Spintherus pulchripennis CRAWFORD, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 168.

Rhopalicus americanus GIRAULT, Ann. Ent. Soc. Amer., vol. 9, 1916, p. 296.

Types of *Spintherus pulchripennis* Crawford and of *Rhopalicus americanus* Girault are in the U. S. National Museum and have been compared. The two are identical. In the opinion of the writer the species is more properly placed in *Rhopalicus* Foerster than in *Spintherus* Thomson.

EUPTEROMALUS COGNATUS, new species.

Very similar to *viridescens* (Walsh) but differs from that species by having the joints of the funicle slightly shorter, the occiput a little more concave, the antennal groove somewhat deeper, the occipital carina very weakly developed, and the punctation of the head and thorax a little stronger.

Female.—Length, 2 mm. Head and thorax with the usual reticulate-punctate sculpture common to the group but the punctures slightly deeper than in most of the other species; abdomen shining, with the tergites, except the first, very obscurely reticulated; scutellum sculptured alike all over or with only a very slight indication of a differently sculptured area at apex; propodeum punctate with a weak median carina.

Head viewed from above broader than the thorax; occiput rather deeply concave medially and very weakly margined; posterior

orbits less sharply receding from the eye margins than in most of the other species; viewed from in front the head is perceptibly broader than high (about 6:5), truncate at the mouth, the cheeks rounded and the vertex distinctly though not greatly arched above the eyes; viewed from the side the front profile is weakly convex, the face below the antennae receding only slightly; mandibles each with four teeth; maxillary palpi 4-jointed, the apical joint the longest joint, the penultimate joint the shortest and hardly half the length of the last; labial palpi 2-jointed; antennal scape cylindrical and as long as pedicel, ring-joints and three first funicle joints combined; ring-joints distinct, subequal; funicle joints all subequal and each a little broader than long; club 3-jointed and equal in length to the last three funicle joints combined; mesoscutum about equal in length to scutellum, with the parapsidal grooves present anteriorly but effaced on the posterior one-fourth; scutellum moderately convex or at least not conspicuously flattened as in *dubius* Ashmead; propodeum moderately hairy laterally, the apical neck distinct but rather short, the spiracles elliptical and moderately large; marginal and postmarginal veins practically equal, the stigmal vein shorter; abdomen pointed ovate, not longer than the thorax and usually a little narrower than the thorax; first tergite comprising approximately one-third the total length of abdomen; second tergite a little less than half the first; following tergites shorter. Color of head and thorax dark aeneous; abdomen mostly metallic blue-black with the first tergite metallic green; wings hyaline, venation pale yellowish; antennal flagellum dark brown, scape and pedicel reddish testaceous; coxae concolorous with thorax; all femora brownish testaceous, the tibiae usually a little clearer testaceous and the tarsi still paler.

Male.—Length, 1.7 mm. Agrees with female except that abdomen, viewed dorsally, is nearly circular in outline and not over two-thirds as long as thorax, and the funicle joints are all practically as long as broad.

Type-locality.—Ballast Island in Lake Erie.

Type.—Cat. No. 26181, U.S.N.M.

The type series consists of twenty specimens, many of them more or less broken and imperfect, received from Miss Mary Auten and all reared by her from the egg capsules of spiders. The type, allotype, and several paratypes were reared, according to the collector, from the egg capsules of *Aranea frondosa* Walckenaer taken on Ballast Island in Lake Erie. Other paratypes are said to have been reared from the capsules of *Epeira scolopetaria* Emerton taken on South Bass and Gibraltar Islands in the same lake while two specimens also taken on South Bass Island are said to have come from the capsule of *Philodromus canadensis*.

Judging by host records of related species it seems more probable that this species is actually parasitic upon some dipterous or hymenopterous larva infesting the egg capsules than that it is present as a parasite of the spider's eggs.

Family EULOPHIDAE.

TETRASTICHUS PHILODROMI, new species.

Resembles somewhat *T. dolosus* Gahan but is aeneous black in color instead of bluish, the abdomen in dorsal profile is only slightly longer than broad and less strongly sculptured, and the median groove on mesoscutum as well as the two parallel grooves on scutellum are almost effaced or very poorly developed. The postmarginal vein bears from two to four erect long bristles on the upper side.

Female.—Length, 1 mm. Head collapsed, the sculpture of face not discernible, vertex, occiput and posterior orbits delicately reticulate; antennae short, the flagellum not equal in length to the dorso-ventral length of head; scape subcylindrical, approximately equal in length to the pedicel and first two funicle joints; pedicel longer than thick, and longer than the first funicle joint; ring-joints very short, the number not discernible; funicle 3-jointed, the joints subequal and subquadrate; club 3-jointed, pointed ovate, thicker than funicle, and about equal to funicle in length; mandibles distinctly tridentate, the inner tooth somewhat more acute than the other two on account of the deeper incision between it and the second; pronotum, mesoscutum, axillae, and scutellum finely and delicately reticulate, the enclosed areas on the praescutum and scutellum somewhat longitudinally compressed; mesoscutum with the median longitudinal groove very indistinct or absent and the scutellum also practically without grooves although there are faint indications of them; propodeum very faintly reticulated, almost polished, with a very obscure median carina; forewing slightly shorter than the length of the insect, evenly rounded at apex; marginal and submarginal veins approximately equal, the former equal to two and one-half times the stigmal; abdomen short ovate, equal in length to the thorax, about four-fifths as broad as long, the dorsal segments weakly reticulately sculptured. Color aeneous-black; antennae brownish, the scape slightly paler; coxae and basal three-fourths of all femora concolorous with the thorax; remainder of legs very pale yellow, the tarsal claws brownish; wings hyaline, the venation brownish.

Male.—Length, 1 mm. Antennal flagellum shorter than the dorso-ventral height of head; scape somewhat thickened, especially at base, as long as pedicel and three first funicle joints combined, on the ventral margin with an elongate sensory pore which extends from apex almost to base and which under high magnification in balsam appears as a row of subquadrate cells along the ventral margin;

pedicel large, fully twice as long as the first funicle joint and equal to one-third the length of scape; ring-joints minute, number not determinable; funicle four-jointed, the joints all subequal and each slightly broader than long; club 3-jointed, ovate, slightly thicker and a little shorter than the funicle; abdomen elliptical, slightly less than twice as broad as long, narrower than the thorax but no longer; otherwise agrees with the female.

Type-locality.—South Bass Island, Ohio.

Type.—Cat. No. 26182, U.S.N.M.

Described from twenty-one females and six males mounted on card points, and twenty-four females and five males mounted in balsam on seven slides. This material all received from Miss Mary Auten, of Ohio University, and all reared by her from the egg capsules of the Arachnid, *Philodromus canadensis*, collected on South Bass Island in Lake Erie, during the month of July, 1921. In addition to the type material several hundred of unmounted specimens of this species were received from Miss Auten, all obtained from the same source. Six paratypes returned to Ohio University and two presented to the British Museum in London. Remainder of type material as well as a large part of the unmounted material retained in the National Museum.

TETRASTICHUS BLEPYRI Ashmead.

Tetrastichus blepyri ASHMEAD, Can. Ent., vol. 34, 1902, p. 302.

Tetrastichus (*Tetrastichodes*) *detrimentosus* GAHAN, Proc. U. S. Nat. Mus., vol. 46, 1913, p. 439.

Tetrastichus blepyri Ashmead was originally described from two specimens reared at Rosewell, New Mexico, by T. D. A. Cockerell as a secondary parasite of *Phenacoccus cavalliae* Cockerell. Its actual host is said to have been *Blepyrus phenacocci* Ashmead infesting the scale insect.

T. detrimentosus Gahan, the types of which are also in the national collection, was described from twenty specimens said to have been reared from *Coccinella sanguinea* at Lakeland, Florida, by G. G. Ainslie. A review of Ainslie's notes shows that *Homalotylus terminalis* (Say) was also present in this rearing under circumstances which make it highly probable that the *Homalotylus* was the actual host of the *Tetrastichus*.

The writer has more recently received two specimens reared at Murray, Utah, August 24, 1913, by P. H. Timberlake from *Microterys*, species infesting *Pulvinaria bigeloviae* Cockerell; two specimens reared from *Physokermes insignicola* (Crawford) at Santa Maria, California, in April, 1912, by Timberlake; one specimen from Alhambra, California, reared from *Saissetia oleae* (Bernard), by Harold Compere; two specimens reared at Arcadia, California, by

H. Compere, from *Saissetia oleae* upon which they were believed to be secondary; one specimen from Santa Maria, California, reared by H. Compere, from *Physokermes insignicola* and probably parasitic upon *Aphycus physokermes* Timberlake which was known to be present; and one specimen reared from *S. oleae* by H. S. Smith, in California, the exact locality not given.

Study of this new and better material in conjunction with the types has convinced the writer that *blepyri* Ashmead and *deterimentosus* Gahan are the same species.

The species is without much doubt normally a secondary parasite of various scale insects and Coccinellidae and appears to be quite widely distributed in North America and may also be found elsewhere.

Superfamily SERPHOIDEA.

Family SCELIONIDAE.

Subfamily BAEINAE

Genus BAEUS Haliday.

All descriptions apparently credit the wingless females of this genus with having the scutellum absent. As viewed by the writer this is not strictly true of the species standing under this name in the National Collection. The mesoscutum is large, occupying most of the thoracic dorsum, but between this sclerite and the abdomen are two transversely linear sclerites, variable in size but always discernible. These two plates apparently represent the scutellum and propodeum respectively. The anterior plate is usually somewhat longer (antero-posteriorly) than the posterior and the latter bears what appear to be the very minute spiracles.

BAEUS ROTUNDIVENTRIS, new species.

Very similar to *B. piceus* Ashmead but slightly larger, a little more strongly sculptured on thorax and abdomen, the abdomen more rotund, the antennal club blackish instead of reddish testaceous, and the head somewhat lighter in color. Also similar to *niger* Ashmead but may be distinguished at once by the broader and more rounded abdomen, which is more sparsely clothed with longer hairs, and by the somewhat longer though strongly transverse propodeal sclerite.

Female.—Lengths 0.8 mm. Wingless. Head, thorax, and abdomen more or less shining, but with distinct, fine reticulate sculpture and sparsely clothed with rather long hairs; eyes distinctly hairy; antennae 7-jointed, the club solid and longer than the funicle; first funicle joint the longest of the funicle joints, pedunculate at base; following joints of funicle slightly broader than long; pedicel large,

as long as the three succeeding funicle joints combined; scape slightly thickened and equal in length to the pedicel and funicle combined; thorax about as long as broad; abdomen much broader than the thorax, nearly circular in outline as viewed from above.

Head and prothorax dark reddish yellow; the vertex more or less infuscated; mesoscutum anteriorly usually more or less obscurely stained with reddish; remainder of thorax and abdomen entirely black; legs brownish mixed with yellowish without any very definite color pattern, the femora, apices of tibiae and the tarsi usually more or less yellowish; antennae dark brown.

Male.—Length 0.95 mm. Wings fully developed. Head transverse, weakly reticulated; occiput concave and margined at vertex; antennae 12-jointed, scape slightly expanded beneath; pedicel a little longer than the first funicle joint, which is distinctly longer than broad, narrower at base than at apex and the longest of the funicle joints; joints 4 to 10 of the antennae moniliform; joints 11 and 12 slightly longer and thicker and more closely joined together, forming a 2-jointed club; mesoscutum faintly reticulated and sparsely hairy; scutellum prominent, convex, broader than long, rounded behind and nearly smooth; propodeum rugulose, very short medially, sharply and perpendicularly truncate behind; abdomen shorter than the thorax and about as broad as the thorax, narrowed at base and broadest behind the middle; the first tergite longitudinally striate basally, smooth at apex; second tergite also striate at base, the apical two-thirds of second and all of the following tergites smooth; wings with rather coarse discal cilia; stigmal vein longer than the marginal; postmarginal subobsolete; basal vein present and distinct. Antennae and legs, except coxae, testaceous; head faintly piceus; thorax and abdomen black; wings hyaline.

Type-locality.—Middle Bass Island, Ohio.

Type.—Cat. No. 26183, U.S.N.M.

Described from twenty-one females and three males reared by Miss Mary Auten, July 4, 1921, from an unknown spider's nest taken under bark of a tree. Five female and one male paratypes in the collection of Ohio State University at Columbus, Ohio. Type, allotype, and sixteen paratypes in the United States National Museum. Antenna of type female on a slide.

Subfamily TELENOMINAE.

PHANURUS PROMACHIVORUS, new species.

Very similar to *Phanurus tabanivorus* Ashmead but differs by having the first funicle joint twice as long as broad and only a little shorter than the pedicel, the elevation on the dorsum of first abdominal segment distinctly more prominent, and the forewings somewhat

more densely ciliated. The males differ from males of *tabanivorus* by having the first funicle longer than the pedicel, the second joint somewhat longer than first, the third subequal to the first, and the head, thorax and abdomen entirely black.

Female.—Length, 1.15 mm. Vertex and posterior orbits, finely reticulate-punctate, remainder of head smooth and polished; eyes not hairy; antennae 11-jointed, clavate; scape subcylindrical, as long as the pedicel and first three funicle joints combined; pedicel about twice as long as thick; first funicle joint more slender than the pedicel, about twice as long as thick and fully three-fourths as long as pedicel; second funicle joint slightly shorter than the first, third a little longer than broad, fourth about as long as broad; club 5-jointed, approximately equal in length to the pedicel and funicle combined, the first and second joints very slightly broader than long, third and fourth subquadrate, fifth longer than broad and conical; mesoscutum convex, sculptured like the vertex; scutellum smooth; propodeum broadly and deeply excavated for reception of the protuberance on first abdominal segment, only the lateral angles visible from above and these small and triangular; wings extending to the apex of abdomen and about one-third as broad as long; the marginal vein about two-thirds as long as the stigmal; postmarginal twice as long as stigmal; discal ciliation moderately dense; marginal cilia short, the longest cilia being at the posterior apical angle of wing; along the anterior margin of wing are about 28 nearly evenly spaced fine bristles between the base of submarginal and the apex of postmarginal veins; marginal cilia of hind wing equal to approximately two-thirds the width of wing; abdomen narrower than the thorax, pointed ovate, one-third longer than the head and thorax, abruptly narrowed beyond second segment, polished, the suture between first and second segments foveate; first segment broader than long with a prominent rounded protuberance above almost equal in height to the length of the segment; second segment comprising a little less than half the total length of abdomen; third segment narrower at base than the second at apex, the third and following segments gradually tapering toward apex of abdomen; ovipositor slightly exerted. Black; trochanters, all tibiae and all tarsi brownish testaceous, the apical joint of all tarsi dark and the front femora more or less brownish; antennae entirely black; wings hyaline.

Male.—Length 0.9 mm. Antennae 12-jointed, not clavate; scape as long as pedicel and two first funicle joints together; pedicel nearly twice as long as thick; first flagellar joint as long and as thick as the pedicel; second longer than the first; third subequal to the first; following joints moniliform and subquadrate, the apical joint longer than broad and ovate; wings extending beyond the apex of

abdomen; abdomen as long as the thorax and about as broad, ovate, the first tergite without a protuberance above and striated at base, suture between first and second tergites foveolate, second tergite occupying fully half the total length of abdomen, the tergites beyond the second short. Black; legs, except coxae, testaceous; coxae piceus; antennal scape testaceous; pedicel and flagellum dark brown.

Type-locality.—Koiwai, Japan.

Type.—Cat. No. 26184, U.S.N.M.

Eight females and seven males received through the U. S. Department of Agriculture, Bureau of Entomology, from C. P. Clausen, by whom they were reared from eggs of *Promachus yesonicus* Bigot, an Asilid fly inhabiting Japan.

A NEW NAUTILOID CEPHALOPOD, *EUTREPHOCERAS SLOANI*, FROM THE EOCENE OF SOUTH CAROLINA.

By JOHN B. REESIDE, Jr.,

Of the United States Geological Survey.

Species of the genus *Eutrephoceras* are rare in the Tertiary deposits of the United States. Whitfield¹ described one, as *Nautilus cookana*, from the Shark River marl of New Jersey, probably of middle Eocene age, but none, so far as the writer knows, has been described from the Eocene of the southeastern United States. The specimen on which this paper is based is therefore of considerable interest, and, though it is perhaps not so complete as one might wish a type specimen to be, most of its essential characters can be made out and are worth recording for the benefit of future collectors.

The specimen was found in silicified marlstone at Perkins Bluff on Black River, Georgetown County, South Carolina, by Earle Sloan, of Charleston, South Carolina, then State geologist, and listed as *Enclimatoceras ulrichi* White.² It was borrowed from Mr. Sloan by Dr. C. Wythe Cooke, of the United States Geological Survey, in order to verify the identification, and when found to differ from the type of *E. ulrichi* was placed in my hands for description. At Doctor Cooke's suggestion, Mr. Sloan has deposited the specimen in the United States National Museum.

Because of the supposed presence of *Enclimatoceras ulrichi*, a Midway species, the beds at Perkins Bluff, belonging to the Black Mingo formation, were regarded by Sloan as of Midway age.³ However, as the rock matrix of the type of *Eutrephoceras sloani* contains impressions of a coral identified by Dr. T. W. Vaughan as *Haimesiastrea conferta* Vaughan, a species ranging through the Midway and Wilcox groups of Alabama, the geologic age of the beds might be either Midway or Wilcox.

¹ Whitfield, R. P., Gasteropoda and cephalopoda of the Raritan clays and Greensand marls of New Jersey: U. S. Geol. Survey Mon. 18, pp. 285-286, pl. 48, fig. 1; pl. 49, figs. 4, 5, 1892.

² Sloan, Earle, Catalogue of the mineral localities of South Carolina: South Carolina Geol. Survey, ser. 4, Bull. 2, p. 319, 1908.

³ Vaughan, T. W., in Willis, Bailey, Index to the stratigraphy of North America: U. S. Geol. Survey Prof. Paper 71, p. 732, 1912.

Family NAUTILIDAE Owen.

Genus EUTREPHOCERAS Hyatt.

According to Hyatt:⁴

This genus includes these forms like the type *E. dekayi*, which have globose ananepionic substages, increasing subsequently with great rapidity in all their diameters. The ana- and metanepionic substages are highly tachygenic and these shells have very small, and often hardly perceptible and much flattened, umbilical perforations. The siphuncles are subdorsan from the apex through the nepionic stage in some species, in others this position is not maintained, but the siphuncle is generally in the later stages near the dorsum and in the ephelic stages it is dorsad of the center.

The nepionic stage has longitudinal ridges and transverse bands, the former disappearing in adults which are smooth.

The form of the whorl in section is nephritic from an early age and changes but little throughout life.

The sutures are almost straight, having but slight ventral lobes, broad ventrolateral saddles, lobes on the umbilical zones, and deep lobes in the zone of impression. There are no annular lobes at any stage of development.

Hyatt's remarks about the genotype are all based on specimens from the Western Interior ("Dakotah"), whereas the true *E. dekayi* (Morton) is from New Jersey. It would seem, therefore, that the real genotype is the unnamed species mistakenly referred by Meek and most other writers to *E. dekayi*.

From the four other genera originally assigned to the family by Hyatt *Eutrephoceras* may be distinguished most easily as follows: From *Digoniceras* Hyatt in having a nephritic rather than sub-trigonal cross section of the whorl in the adult; from *Cenoceras* Hyatt in having a nephritic rather than subquadrangular cross section of the whorl in the adult; from *Cymatoceras* Hyatt in the lack of broad ribs on the shell and in the straighter suture; from *Nautilus* Linnaeus in the broad outline of all the later stages, the general position of the siphuncle dorsad of the middle of the septum, and the straighter sutures. (See fig. 1b.) From the genera *Hercoglossa* Conrad (*Enclimatoceras* Hyatt) and *Aturia* Brown of the family Clydonautilidae, which also occur in the Eocene, *Eutrephoceras* differs sharply in suture. (See fig. 1a.)

The writer has examined a number of specimens of *Eutrephoceras* of Cretaceous age. The sutures are very much alike in all of them; the shell of all of the larger specimens, when preserved, is nearly smooth; and the position of the siphuncle is very much the same in all. The conspicuous differences between them are in the form of the cross section of the whorl and the size of the shell. These seem to offer a valid basis for separation into species, and, so far as the writer's material goes, form and size are constant within considerable

⁴ Hyatt, Alpheus, Phylogeny of an acquired characteristic: Amer. Philos. Soc. Proc., vol. 32, p. 555, 1894.

groups of specimens of the same age and restricted geographic distribution and differ between the respective groups. It is likely that if complete and well-preserved shells were available numerous other differences would be found, but it seems desirable to distinguish the various groups that can be recognized now even though some of them are difficult to separate on the basis of such details as are commonly preserved.

EUTREPHOCERAS SLOANI, new species.

Shell of medium size, the largest diameter of the type specimen preserved being about 140 mm. (the complete shell must have been

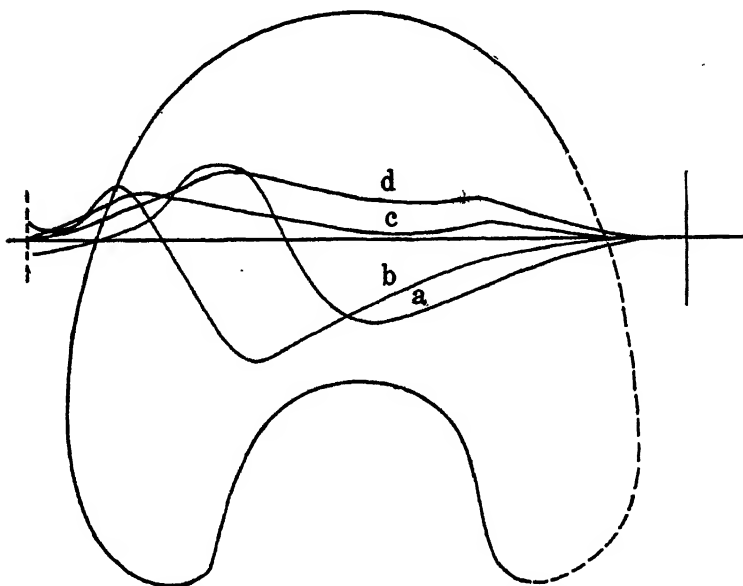


FIG. 1.—CROSS SECTION OF WHORL OF *EUTREPHOCERAS SLOANI* REESIDE AT DIAMETER OF 140 MM., NATURAL SIZE. *a*, SUTURE OF *ENCLIMATOCERAS ULRICHI* WHITE, EOCENE, AT DIAMETER OF 140 MM. ($\times 7/10$). *b*, SUTURE OF *NAUTILUS POMPILIUS* LINNAEUS, RECENT, AT DIAMETER OF 140 MM. ($\times 7/9$). *c*, SUTURE OF *EUTREPHOCERAS SLOANI* REESIDE, EOCENE, AT DIAMETER OF 120 MM. ($\times 7/9$). *d*, SUTURE OF *EUTREPHOCERAS DEKAYI* (MORTON) OF MEEK, CRETACEOUS, AT DIAMETER OF 100 MM., NATURAL SIZE.

150 mm. in maximum diameter); stout, well rounded in all the stages visible. Cross section of whorl moderately compressed, nephritic, changing very little with increase in size of shell; height and breadth of the cross section about equal. Siphuncle dorsad of the center of the septum. Umbilicus closed.

Surface of shell not seen. Cast of interior smooth in both early and late stages.

Sutures are those of the genus—nearly straight with shallow ventral lobe, ventrolateral saddle, lateral lobe and saddle, and umbilical lobe.

Holotype.—Cat. No. 352,559 U.S.N.M.

Eutrephoceras sloani differs from *E. cookana* Whitfield⁵ chiefly in size, the latter species attaining a diameter of 300 mm. The cross section of the whorl is much the same in both species but is a little broader in the Shark River species. It is possible that further collecting will show that *E. sloani* attains a large size, has a considerable range of variation in form, and is therefore inseparable from *E. cookana*. However, it seems best with the material now in hand to consider the South Carolina species as distinct from the New Jersey species. The other American species of the genus *Eutrephoceras* known to the writer are Upper Cretaceous in age and have nearly all been referred at some time to *E. dekayi* (Morton), though unquestionably different. *E. dekayi* (Morton), as refigured by Whitfield,⁶ from the Navesink and Redbank formations of New Jersey is about the same size as *E. sloani* but is stouter, the proportion of height to width of the cross section of the whorl being about 3 to 4. *E. bryani* (Gabb), as refigured by Whitfield,⁷ from the Vincentown sand of New Jersey, is more compressed than *E. sloani*, the proportions of height to width of the cross section of the whorl being about 8 to 7. An undescribed species from the Ripley formation of Alabama is stouter and apparently of consistently smaller size than *E. sloani*. Another from the Navarro formation of Texas is separated by the presence of a persistent flattened zone on the venter. A third undescribed species from the Gulf region occurs in the zone of *Mortonicer* *texanum* and is stouter proportionately and much larger. A species occurring in the upper part of the Pierre formation and equivalent horizons in the Western Interior Province, called by Meek⁸ *Nautilus dekayi* Morton and forming the real type of the genus *Eutrephoceras*, is about the size of *E. sloani* but is much stouter, the height to breadth of the cross section of the whorl being about 3 to 4. An undescribed species from the Eagle sandstone of Montana attains a larger size (240 mm. diameter) and is stouter, the height to breadth of the cross section of the whorl being about as 6 to 7.

EXPLANATION OF PLATES.

PLATE 1.

Eutrephoceras sloani Reeside, back view, five-sixths natural size.

PLATE 2.

Eutrephoceras sloani Reeside, front view, five-sixths natural view.

PLATE 3.

Eutrephoceras sloani Reeside, side view, natural size.

⁵ Whitfield, R. P., U. S. Geol. Survey Mon. 18, pp. 285-286, 1892.

⁶ Whitfield, R. P., U. S. Geol. Survey Mon. 18, p. 243, pl. 37, figs. 1-6; pl. 38, figs. 1-4.

⁷ Whitfield, R. P., U. S. Geol. Survey Mon. 18, p. 244, pl. 38, figs. 5, 6.

⁸ Meek, F. B., Invertebrate Cretaceous and Tertiary fossils of the Upper Missouri country: U. S. Geol. Survey Terr., vol. 9, pp. 496-498, pl. 27, figs. 1, 2, 1876.



EUTREPHOCERAS SLOANI REESIDE, BACK VIEW.

FOR EXPLANATION OF PLATE SEE PAGE 4.



EUTREPHOCERAS SLOANI REESIDE, FRONT VIEW.

FOR EXPLANATION OF PLATE SEE PAGE 2.



EUTREPHOCERAS SLOANI REESIDE, SIDE VIEW.

FOR EXPLANATION OF PLATE SEE PAGE 4.

DESCRIPTION OF A RECENTLY DISCOVERED FOSSIL SCULPIN FROM NEVADA REGARDED AS *COTTUS BELDINGI*.

By DAVID STARR JORDAN.
Of Stanford University, California.

I have received from Mr. F. B. Headley, superintendent of irrigation for the United States Department of Agriculture, stationed at Fallon, Nevada, a number of small fossil sculpins from deposits of Lake Lahonton. I identify these with a living species of the same region, *Cottus beldingi* Eigenmann and Eigenmann.

COTTUS BELDINGI Eigenmann and Eigenmann.

Head 3 times in length to base of caudal; depth about 4; pectoral about as long as head; dorsal rays VII to VIII, 17 to 19; anal 12 to 14; ventral rays I, 4; the fin 3 in head; caudal a little longer than head; vertebrae about $12+20=32$. Length of specimens in all cases, $2\frac{1}{2}$ inches.

Body moderately elongate; head large, more or less crushed in all examples so that individual bones can not well be traced. A short forked spine on preopercle present in one example. Insertion of dorsal fin not far behind head; its spines very slender, the second longest, somewhat produced, about half head; other spines rapidly shortened; soft rays slender, rather high but shorter than longest spine (the last rays of dorsal and anal more or less obscure). Pectoral rays 11 or 12, the fin broad; actinosts forming a considerable flat plate; ventrals shorter, 3 in head, entirely separate; thoracic, present in three examples, the rays strong and relatively long; vertebrae strong, short, and deep, hour-glass shaped, each with two prominent longitudinal ridges. Hypural strong; caudal broad, rounded, with 15 rays. No trace of scales or spinules.

Of this species we have seventeen examples, all more or less broken, besides several fragments. These are imbedded in a chalky or calcareous deposit containing many diatoms, with fine sand of crushed chalcedony and quartz, mixed with more or less clay.

Mr. Headley observes that the specimens were obtained from "a cave on the east side of the Carson Sink about five miles south of

Stillwater. The cave is about 50 feet above the floor of the old Lake Lahontan and probably 350 feet below the highest beach line. The fossils were 6 feet below the surface of the ground. The walls of the cave were encrusted with tufa rock deposited by the old lake. The specimens were plentiful, in a layer not over one foot wide."

The question of the age of this deposit has been referred to Prof. J. C. Jones, of the University of Nevada, who decides, after personal examination of the deposits, that "the fish skeletons were deposited in Lahontan-time and probably not over a thousand or fifteen hundred years in age, if my conclusion as to the age of Lake Lahontan are correct. . . . Their living relatives should be found in Pyramid Lake, which is a remnant of Lake Lahontan. The greater bulk of the diatomaceous earth in Nevada was deposited during Middle Miocene time in western Nevada. The Lake Lahontan beds contain very little diatomaceous earth as the waters were rather muddy, but it is possible that in the protected cave, the diatoms lived in water clear enough to have formed rather pure diatomaceous earth of Lahontan age."

The specimens here figured are numbered 10905-10907 in the collection of the United States National Museum. Cotypes are in the collection of Stanford University. This description is drawn from the entire series, not one having all the fins complete. The species is evidently a *Cottus*, and it may be identical with one or more of the four fossil species described by Cope in 1883, from Pliocene deposits of the former Lake Idaho. (*Cottus divaricatus*, *D. pontifex*, *D. hypoceras* and *C. cryptotremus*.) These are all known only as many detached preopercles, and can not well be contrasted with *Cottus beldingi*.

The last named species, first described (in 1891) from Lake Tahoe and Donner Lake, is now found in all suitable waters throughout the Lahontan Basin, and is recorded from various localities in the upper Columbia (Jordan and Evermann). The only apparent differences are these: in *Cottus beldingi* the preopercular spine is simple and the ventral rays seem a little more slender than in the fossil.

EXPLANATION OF PLATE.

Fossil examples of *Cottus beldingi* Eigenmann and Eigenmann. Upper views are ventral aspects and the lower ones show dorsal views. Natural size.



COTTUS BELDINGI EIGENMANN AND EIGENMANN

FOR EXPLANATION OF PLATE SEE PAGE 2

NEW SPECIES OF MOTHS IN THE UNITED STATES NATIONAL MUSEUM.

By WILLIAM SCHAUS,

Honorary Assistant Curator, United States National Museum.

There have accumulated in the collections of the United States National Museum a large number of unidentified moths, many of them new to science, 150 of which are described in the present paper.

Family AMATIDAE.

SPHECOSOMA BESASA, new species.

Male.—Antennae buff yellow, streaked and banded at middle with black followed by some white below, the terminal fourth black. Palpi yellowish white. Head black with a fine white line on vertex, the frons rubbed but apparently white; neck buff yellow. Tegulae buff yellow with a fine black line in front, broadly black behind. Thorax buff yellow, a black spot on metathorax; patagia edged with black dorsally and behind. Abdomen above antique brown on basal half, the terminal half black; underneath yellowish white, the three last segments black. Legs buff yellow, the fore and mid tarsi with minute dark rings. Wings hyaline, the veins very finely and cilia orange citrine. Fore wing with costal and vein 1 more thickly scaled at base.

Expanse.—23 mm.

Habitat.—Victoria, Brazil.

Type.—Cat. No. 25870, U. S. N. M.

Nearest *S. linda* Jones.

ISANTHRENE RORERI, new species.

Male.—Antennae xanthine orange. Palpi, head, collar, and thorax ochraceous buff, palpi streaked above with black; base of antennae and a transverse streak on vertex black; tegulae edged with black; black lines on thorax; patagia edged with black; metathorax black posteriorly. Abdomen above black; basal segment with a dorsal white spot and an ochraceous buff spot on either side, also a lateral light orange yellow spot; the following three segments with broad light

orange yellow bands separated dorsally by a fine black line; these yellow bands extending sublaterally; terminal segments with transverse steel blue lines; underneath white with black segmental lines, the last segments black. Wings yellowish, hyaline, the veins black. Fore wing with the costa ochraceous; margins finely black, expanding somewhat at apex and base of inner margin, the latter with two ochraceous streaks. Hind wing with termen finely black; inner margin black with orange yellow fringe and similar scaling at base and in cell. Fore wing below with only the terminal third finely black, the inner margin whitish. Hind wing below with inner margin light orange yellow.

Expanse.—41 mm.

Habitat.—Near Macas, Ecuador.

Type.—Cat. No. 25871, U.S.N.M.

Received from Mrs. E. W. Rorer.

AUTOCHLORIS ETHELA, new species.

Female.—Antennae black. Palpi, head, and thorax fuscous black; metallic azurite blue scales on vertex behind. Abdomen above mostly fuscous black; large paired white spots on first and second segments; light squill blue and white irrorations subdorsally on third segment; on the following three segments fine lines posteriorly of blue irrorations not meeting dorsally; last segments entirely scarlet red with a black dorsal line; segments 4-6 laterally scarlet red, ascending obliquely towards dorsum; underneath fuscous. Legs fuscous; some white scales at throat, on fore coxae, and white lines laterally at mid and hind femora. Wings hyaline white, the veins and margins narrowly black. Fore wing with hyaline streaks on basal half above and below costal vein; base narrowly black; an upright antemedial black bar from median to submedian; a similar bar on discocellular to costa.

Expanse.—40 mm.

Habitat.—Baños, Ecuador.

Type.—Cat. No. 25872, U.S.N.M.

Received from Mrs. E. W. Rorer, in whose honor I name this species.

Near *A. cuma* Druce.

AUTOCHLORIS SOLIMONES, new species.

Female.—Head and body black; some metallic blue on frons, vertex behind, tegulae, metathorax and dorsally on basal segment of abdomen, the same segment with crimson subdorsal spots and a more outset crimson line on following segment. Legs black; a crimson streak on inner side of fore coxae. Wings hyaline white, the veins black. Fore wing with termen rather broadly black, its inner

edge curved and angled at vein 2; costa and inner margin narrowly black; a large black spot on discocellular. Hind wing with cell and costa at base broadly black; termen black.

Expanse.—26 mm.

Habitat.—Mouth of Rio Teffé and Rio Solimoes, Brazil.

Type.—At Cornell University.

Paratype.—Cat. No. 26166, U.S.N.M.

Collected by the Cornell University Expedition, September 5, 1920. We are indebted to the university for the paratype.

SAROSA ALBRAAMEA, new species.

Male.—Antennae black tipped with buff yellow and white. Palpi avellaneous with a fine lateral black line. Head, collar, and thorax buff yellow; large black spots on tegulae; thorax at middle and edges of patagia black, the dorsal edge very broadly so. Abdomen above black with transverse buff yellow lines, the basal segment entirely buff yellow with a black dorsal spot; underneath fuscous black with short segmental white lines to either side, the valve white with some black and buff yellow scaling at base. Legs entirely buff yellow. Wings hyaline, the veins mostly buff yellow thickly irrorated with black. Fore wing; costal margin orange buff with semi-hyaline streaks on basal half above and below costal vein; outer margin fuscous black expanding slightly toward apex and at submedian fold and vein 2. Hind wing with termen fuscous black, expanding below vein 2 to anal angle; costa straw yellow; inner margin narrowly buff yellow; an inangled spot at discocellular. Hind wing below with the cell and costa buff yellow, the latter fringed with fuscous scales from just before middle to apex.

Expanse.—27 mm.

Habitat.—Rio Potaro, British Guiana.

Type.—Cat. No. 25873, U.S.N.M.

Near *S. atritorna* Dognin.

GYMNELIA DUCEI, new species.

Female.—Antennae black with a white point at base. Head and body black; collar edged behind with xanthine orange and a similar streak on patagia; a short buff yellow segmental line on either side of basal segment of abdomen; subdorsal transverse blue bands on following segments, also lateral and sublateral blue spots; end of abdomen orange; ventrally the two basal segments white. Legs black partly irrorated with blue. Fore wing hyaline tinged with yellow ochre along veins; margins finely black; a buff yellow streak below submedian; apex rather broadly black. Hind wings hyaline white, the margins finely black, expanding before anal angle.

Expanse.—32 mm.

Habitat.—Head of Carare River, Colombia.

Type.—Cat. No. 25874, U.S.N.M.

Collected by T. Duce.

To be placed near *G. frutera* Schaus.

GYMNELIA CENNOCHA, new species.

Female.—Antennae black; a white point at base in front. Palpi black with a few white scales in front. Head and thorax black; frons white; tegulae almost entirely cerulean blue; a similar streak along dorsal edge of patagia. Abdomen black with broad marine blue bands, the last two segments and anus orange buff; two orange spots on basal segment; a lateral white spot on basal segment; underneath black; base white; terminal segments orange. Legs black, partly streaked with blue; white spots on mid and hind coxae. Wings hyaline, the veins black. Fore wing: an orange streak above subcostal vein from middle of wing to apical space; a white point on base of costa; base and inner margin black, the latter with black reaching submedian vein on basal third; termen black, expanding somewhat at vein 2, and from vein 3 to costa so the apex is broadly black; a black bar on discocellular. Hind wing with the termen narrowly black, expanding below vein 2 and suffusing with the rather broad black inner margin; upper portion of cell black; a black spot on lower part of discocellular.

Expanse.—33 mm.

Habitat.—Rio Trinidad, Panama.

Type.—Cat. No. 25875, U.S.N.M.

Near *G. colona* Schaus.

GYMNELIA LUDGA, new species.

Female.—Antennae black; a cream white spot at base in front. Palpi black, the base and second joint below cream color. Head black, the frons with cream color scales at sides and above; frons with metallic blue scales. Tegulae black, edged with buff yellow, the center ovate in shape. Thorax black; metallic blue scaling on front of patagia and metathorax; some yellow hairs below shoulders. Legs black streaked with blue; coxae with blue spots; mid tarsi orange. Abdomen black; red spots subdorsally on basal segment, and large lateral blue spots on other segments; sublateral blue spots on two basal segments. Wings hyaline, the veins black. Fore wing: inner margin and apex narrowly black; cilia black. Hind wing: cilia black; a small black patch at anal angle; upper portion of cell black. Hind wing below with upper portion of cell with whitish scales edged below by a black line.

Expanse.—27 mm.

Habitat.—Colombia?

Type.—Cat. No. 25876, U.S.N.M.

Received from Dr. H. G. Dyar.

PHEIA DOSITHEA, new species.

Female.—Antennae fuscous with gray streaks at tips; a white point at base. Palpi and head black; some white scaling in front; some blue scales on vertex; neck white. Tegulae, thorax, and abdomen fuscous; some blue scales on tegulae and buff yellow streaks on dorsal edge; similar broad streaks on patagia downangled in front on shoulders; a broad yellow white band on basal segment of abdomen, the other segments with fine buff yellow segmental lines and traces of subdorsal and lateral blue scaling, the anal hairs buff yellow. Abdomen below with white segmental lines on two basal segments. Legs fuscous, the mid and hind tarsi clay color; white points on coxae. Wings hyaline, the veins fuscous black. Fore wing: inner margin and termen fuscous black, expanding above vein 4 to costa and at vein 2; an ochraceous buff line on costal vein, similar streaks above and below vein 1 to near middle. Hind wing: termen rather narrowly fuscous black, the inner margin more broadly black; upper part of cell and disco-cellular with dark scaling; costa white. Hind wing below with costa to beyond end of cell and upper part of cell buff yellow.

Expanse.—27 mm.

Habitat.—Aroa, Venezuela.

Type.—Cat. No. 25877, U.S.N.M.

Can be placed near *P. serpens* Kaye.

PHEIA PROTERIA, new species.

Male.—Head and body black; scarlet spots on tegulae and shoulders; a transverse yellow white spot on basal segment of abdomen, blue black bands on following segments, slightly metallic on last two segments. Antennae streaked with white before tips; fore coxae, a lateral spot on pectus, and spots on mid and hind coxae white; base of abdomen below and ventral valve white. Wings hyaline, the veins black. Fore wing: margins black, the termen broadly so especially from vein 4 to apex, also below vein 2; a black fascia on discocellular widest on costa; a scarlet spot at base below cell. Hind wing: termen black, widest at apex.

Expanse.—25 mm.

Habitat.—Cabima, Panama.

Type.—Cat. No. 25878, U.S.N.M.

Collected by A. Busck.

Near *P. haematosticta* Jones.

LOXOPHLEBIA TIBBA, new species.

• *Male*.—Antennae blue black with a white streak below before tips. Body blue black; an orange red line on shoulders. Legs black; the last joint of hind tibiae and basal half of hind tarsi white on upper side; a white streak on base of fore tarsi. Wings hyaline, the veins black. Fore wing: base and margins black, the outer margin expanding above vein 2 to costa; discocellular obliquely black. Hind wing with margins and cell black. Wings below as above.

Expanse.—20 mm.

Habitat.—Aroa, Venezuela.

Type.—Cat. No. 25879, U.S.N.M.

Near *L. masa* Druce.

CHROSTOSOMA ENNA, new species.

Female.—Antennae and palpi fuscous. Head, collar, and thorax black; pectus and legs fuscous. Abdomen orange buff; the anal and posterior portion of adjoining segment black; underneath with only the anal segment black. Wings hyaline, the veins black. Fore wing with the margins narrowly black expanding at apex and vein 2; a hyaline streak on costa from base to above discocellular. Hind wing; termen narrowly black expanding at apex and before anal angle.

Expanse.—27 mm.

Habitat.—Colombia?

Type.—Cat. No. 25880, U.S.N.M.

From Staudinger as *Cosmosoma stibostictum* Butler. Hampson gives as Ab. 1, a form without white points at base of fore wings or white on head, thorax, and coxae; this form has been named *dealbata* by Draudt. It is possible that both Hampson and Draudt failed to examine the venation and that it is the same as *C. enna* Schaus.

CHROSTOSOMA LEA, new species.

Male.—Body above and legs black; a crimson spot on shoulders and a large spot on patagia; lateral white patches at base of abdomen. Body below yellowish white, the abdomen with fine black segmental lines. Fore wing hyaline smoky white, the veins black; inner margin fuscous black and similar irrorations from termen along vein 2 to near cell, also about discocellular; apex black. Hind wing hyaline white, the veins black; termen suffused with black, especially at apex and before anal angle.

Expanse.—25 mm.

Habitat.—Potaro River, British Guiana.

Type.—Cat. No. 25881, U.S.N.M.

Near *C. dolens* Walker.

COSMOSOMA JOAVANA, new species.

Male.—Antennae black tipped with white. Head and body black; frons metallic blue and similar spots on tegulae; broad orange rufous lines on patagia; a blue patch on metathorax; dorsal, lateral, and sublateral blue spots on abdomen; metallic blue on pectus and fore femora; fore tibiae inwardly streaked with whitish. Wings hyaline, the veins black. Fore wing: an orange rufous streak on costa and on inner margin to near termen; a short streak above submedian at base; similar spots between veins 2 and 4 at cell, and one subterminally between veins 1 and 2; termen black, expanding from vein 4 to costa; a black bar on discocellular. Hind wing with the margins black, the cilia tipped with white at apex. Fore wing below with the inner margin black; a salmon orange streak along costa and similar spots at cell between veins 2 and 4. Hind wing below as above; a broad salmon orange streak on basal half of costa; the terminal area clothed with rough scales.

Expanse.—32 mm.

Habitat.—Juan Viñas, Costa Rica.

Type.—Cat. No. 25882, U.S.N.M.

Allied to *C. proton* Druce and *C. purulha* Schaus.

COSMOSOMA GRETA, new species.

Male.—Palpi, head, abdomen, and legs black, metallic blue patches on frons, vertex, and fore coxae, large lateral spots on abdomen, and sublateral spots on basal half; base of abdomen below white; tegulae, thorax, and patagia dragon's blood red; some blue scaling on thorax; fuscous hairs on edge of patagia. Fore wing hyaline white, the veins and margins black, the apex broadly so; a black bar on discocellular; a dragon's blood red line above subcostal to black apical space, a similar line below submedian, and basal scaling from cell to vein 1, also patches between veins 2 and 4 from cell, reaching near tornus below vein 3, shorter above 3. Hind wing black; a hyaline streak below cell, one at lower angle in cell, and two beyond cell. Wings below with orange red scaling at base of costa on fore and hind wing, the patch between veins 2 and 4 entirely black; hind wing with termen clothed with rough scales.

Expanse.—33 mm.

Habitat.—Rio de Janeiro, Brazil.

Type.—Cat. No. 26062, U.S.N.M.

Near *C. remotum* Walker.

PSILOPLEURA SENANA, new species.

Female.—Palpi and body black; some metallic blue on frons, vertex, tegulae, and forming subdorsal spots on abdomen; a scarlet

red spot on shoulder, and a similar dorsal spot at base of abdomen. Body below and legs fuscous black; white scaling on pectus and fore femora. Fore wing hyaline irrorated with black hairs on basal half; veins, inner margin, and termen narrowly, apex broadly black; a smoky shade across end of cell and discocellular from costa to inner margin. Hind wing hyaline white irrorated with black hairs towards the black termen and especially on submedian fold; costa narrowly black. Underside as above.

Expanse.—26 mm.

Habitat.—Porto Velho, Madeira River, Brazil.

Type.—Cat. No. 25883, U.S.N.M.

A male from the same locality and evidently belonging to this species has the hind wing more densely scaled, white. The inner margin of fore wing below white, the pectus and abdomen below white, and white streaks on fore and hind femora.

SAURITA ANSELMA, new species.

Male.—Antennae fuscous black. Frons white; vertex black with scarlet hairs behind. Tegulae and thorax scarlet. Abdomen black, the basal segment with blue scaling dorsally and subdorsal vertical scarlet lines. Legs black, the fore tibiae inwardly grayish. Wings black. Fore wing: the base scarlet, broader on costa than on inner margin; a hyaline streak in cell, bifurcating towards end of cell; a hyaline streak below cell to vein 2; some blue scaling on lower discocellular; cilia grayish white. Hind wing: cilia grayish white. Wings below with base scarlet, on hind wing broadest on costal margin; some light mouse gray shading at tornus of fore wing and on termen of hind wing, upbent above submedian.

Expanse.—28 mm.

Habitat.—Tabernilla, Panama.

Type.—Cat. No. 25884, U.S.N.M.

Collected by A. Busck.

SAURITA GERALDA, new species.

Female.—Antennae black with gray tips. Head black; blue scaling on frons and vertex. Tegulae and thorax orange rufous, the tegulae edged with opalescent blue scales, and some similar irrorations on patagia and shoulders; metathorax thickly irrorated with opalescent blue scales. Abdomen black; a dorsal bluish white line; a lateral dull whitish line. Legs fuscous black. Wings smoky hyaline, the veins black. Fore wing: the margins narrowly black, expanding at base of inner margin to submedian fold; subbasal blue scaling on costa and median vein; discal fold with a black line projecting into cell; some blackish suffusions before termen from vein

3 to costa forming short streaks on interspaces. Hind wing with the margins black, rather wider on inner margin than on termen.

Expanse.—22 mm.

Habitat.—San Esteban Valley, Venezuela.

Type.—Cat. No. 25885, U.S.N.M.

Received from Dr. H. G. Dyar.

DYCLADIA MARMANA, new species.

Female.—Palpi fuscous. Antennae black with white before tips. Head and body fuscous black; frons and vertex with metallic blue scaling; bluish white spots on tegulae in front, points on shoulders, and irrorations on thorax; some faint bluish white scaling on abdomen dorsally, and similar lateral patches; underneath with ochraceous shading on basal segment. Legs fuscous; a streak on inner side of fore femora, mid and hind tarsi, also throat cream buff. Fore wing fuscous black; a blue point at base. Hind wing fuscous black faintly tinged with blue black; cilia on inner margin white. Wings below fuscous black; some white hairs at base of fore wing below cell. The antennae are pectinated, the hind tibiae and tarsi smooth; otherwise it might be taken for a *Macrocneme*.

Expanse.—31 mm.

Habitat.—Potaro River, British Guiana.

Type.—Cat. No. 25886, U.S.N.M.

DYCLADIA BASIMACULA, new species.

Male.—Palpi ochraceous orange, the third joint, except narrowly at base, and tips of second joint black. Head black; a transverse band in front of antennae ochraceous orange. Antennae black, the basal joint ochraceous orange. Body above black; outer edge of tegulae, the patagia and a lateral stripe on abdomen ochraceous orange; some black hairs on outer edge of patagia. Legs black; fore coxae capucine yellow, other coxae, and base of tarsi pale orange yellow. Fore wing semi-hyaline pale ochraceous buff; a large black spot at base and one at end of cell with a black fascia below it to termen, this fascia extending from vein 3 to inner margin; a large black spot occupying the apical space; costal margin and inner margin to middle cinnamon rufous; termen between veins 3 and 5 narrowly fine orange; veins across semi-hyaline portions orange buff. Hind wing capucine yellow, the termen black broadly from vein 2 to costa. Wings below similar but the basal spot or fore wing much smaller.

Expanse.—30 mm.

Habitat.—Caura Valley, Venezuela; also from Trinidad.

Type.—Cat. No. 26063, U.S.N.M.

It is possible that this is the true *D. correbiodes* Felder as his figure shows some black at base of fore wing, and it would be necessary to examine the type; should this prove to be the case I suggest the name of *D. felderi* for the race from Colombia and Panama which usually goes under the name of *D. correbioides*; it differs in having no black spot at base of fore wing, the lateral line on abdomen much shorter, not reaching beyond middle of abdomen, the legs black with the base of tarsi and coxae yellow. In collection from Merida, Venezuela, and Panama. The race found from Costa Rica to Mexico has all the coxae black and for this I suggest the name of *D. emerita*.

MACROCNEME EUPHRASIA, new species.

Male.—Antennae black tipped with white. Palpi fuscous black, laterally white at base. Head black; frons with lateral white spots; some white irrorations on vertex. Collar and thorax black; tegulae with metallic golden green scaling and white lines on dorsal and lateral edge; thorax mottled with golden green and a similar streak on patagia. Abdomen above golden bronze; basal segment with subdorsal black patches containing a white spot; sublateral white spots on two basal segments; underneath black with transverse green bands and ventral white spots except on last two segments. Legs black, white points on coxae; hind tibiae with white fringe at tips. Fore wing fuscous black; two white points at base; some golden green scales on base of costa, a broad streak below cell on basal fourth, and a streak along inner margin to beyond middle. Hind wing fuscous black, faintly tinged with blue black; a white spot at base of cell. Fore wing below with golden green irrorations on basal half of costa, in cell to beyond middle and a streak below cell; some white hairs at base of median, and a blue white line on submedian medially. Hind wing below with a golden green streak on costa and one in cell.

Expanse.—35 mm.

Habitat.—Potaro River, British Guiana.

Type.—Cat. No. 25887, U.S.N.M.

This species comes nearest *M. lades* Cramer, which has only a golden green spot at base.

The species identified by Hampson as *lades* is quite different and must stand as *M. leucostigma* Perty.

PSEUDAETHRIA, new genus.

Male.—Proboscis fully developed; palpi upturned reaching vertex of head, smooth, the third joint short; antennae bipectinate with short branches dilated at extremity, the apical part serrate; abdomen slightly constricted at base, the last segment with lateral tufts. Fore wings normal, the outer margin oblique; vein 2 from just beyond

middle of cell; 3 from before angle; 4 and 5 from angle; 6 from upper angle; 7 to 10 stalked; 11 from cell. Hind wing with vein 2 from long before angle; 3 and 4 stalked from angle; 5 from above angle; 6 and 7 from upper angle.

Type of the genus.—*Pseudaethria cessogae* Schaus.

Near *Aethria*.

PSEUDAETHRIA CESSOGAE, new species.

Male.—Antennae black with a short white streak on shaft beyond middle. Head and body above ochraceous orange, underneath yellow; some black streaks on palpi and fore coxae; tarsi partly black; last segment of abdomen below black crossed by a metallic blue line; anal and lateral tufts fuscous black; anal segment above light metallic blue. Wings hyaline, the veins black. Fore wing: the base ochraceous orange, indentate below cell; inner margin, costa, and apex narrowly black; cilia black. Hind wing: costa and termen very narrowly black, expanding somewhat below vein 2 and more so at anal angle; inner margin finely orange. Underneath both wings with yellow at base.

Expanse.—33 mm.

Habitat.—Joinville, Brazil.

Type.—Cat. No. 25888, U.S.N.M.

Received from Julius Arp.

EPISCEPSIS SATANIA, new species.

Male.—Palpi, head, thorax, legs, fore wing, and basal hairs on abdomen sepia. Abdomen blue black with some silvery green scaling on terminal segments, also on head, irrorations on tegulae, a slight transverse bar on thorax, and fine streaks on patagia; fore coxae entirely silvery green. Hind wing blue black; a streak below cell whitish, thinly irrorated with black. Wings below fuscous; hind wing with a white streak below cell, and a broader white streak before inner margin.

Expanse.—26 mm.

Habitat.—Santa Rosa, Mexico.

Type.—Cat. No. 25889, U.S.N.M.

The hind wing above without tuft of long hair at base of inner margin.

ANTICHLORIS LAMALISSA, new species.

Male.—Antennae blue black. Palpi fuscous black; a lateral white line on first joint. Head, collar, and thorax black; metallic blue green scaling on frons, vertex, and tegulae; metallic green scaling on thorax and streaks on patagia. Abdomen above golden green with subdorsal black stripes; a lateral white spot on second segment and sublateral white stripes, macular on two terminal segments; ven-

trally golden green. Legs fuscous black; transverse white lines on fore coxae. Fore wing blue black; a small blue green spot on base of costa; a metallic green streak in cell from well beyond base, bifurcating and not reaching end of cell; similar streaks from base below cell and fold, and a narrow streak below vein 1 which is the shortest and does not reach middle of wing. Hind wing black tinged with purple, the costa broadly ochreous white. Fore wing below mostly dark purplish blue, the disk shaded with blue green, the space covered by hind wing whitish partly covered with fuscous hairs. Hind wing below tinged with purple, the costa and cell blue green.

Expanse.—38 mm.

Habitat.—Sitio, Costa Rica.

Type.—Cat. No. 25890, U.S.N.M.

LYMIRE LACINA, new species.

Female.—Palpi, throat, fore coxae, and back of head capucine orange. Frons, tegulae, thorax, and fore wing light drab. Abdomen above fuscous, underneath white. Legs light drab streaked with whitish gray. Fore wing with costal edge toward apex and cilia whitish; underneath brownish drab the apical area suffused with white, and a whitish streak at base below costa. Hind wing above thinly scaled brownish drab, the base whitish; underneath similar.

Expanse.—35 mm.

Habitat.—Matanzas, Cuba.

Type.—Cat. No. 25891, U.S.N.M.

Probably a local form of *L. edwardsii* Grote, with darker wings.

HORAMA SERENA, new species.

Male.—Antennae black with yellow tips. Palpi, head, collar, and thorax buff yellow; a fuscous streak on outer edge of patagia. Abdomen saccardo's umber; two dorsal white spots on first segment, uniting in front; ventral valve laterally edged with white. Legs mostly orange or orange buff; fore tibiae and tarsi whitish buff; joints of hind tibiae fuscous. Fore wing tawny olive. Hind wing orange buff at base to middle of costa and inner margin before angle; termen tawny olive. Wings below tawny olive, the costal margin of hind wing broadly capucine yellow.

Expanse.—28 mm.

Habitat.—Canal Zone, Panama.

Type.—Cat. No. 25892, U.S.N.M.

The antennae are pectinated, the hind tibiae and tarsi naked.

LEUCOPLEURA CIARANA, new species.

Male.—Antennae black. Palpi black; a few white hairs at tip of first joint and at base of third joint. Head and body black; frons

white; metallic blue spots on tegulae; white points on shoulders; two small white spots on thorax in front edged with blue scales, and some blue irrorations between them; metathorax with dorsal blue patch and lateral white tufts. Abdomen with subdorsal lines and ventral white stripe; white spots on coxae; hind legs inwardly white. Fore wing blue black; a white and blue point at base of costa; a blue stripe below cell from base to an antemedial ovate hyaline white spot; some blue at base of inner margin; an oblique hyaline fascia beyond the cell from veins 3-7, but interrupted between 5 and 6, only a short fine streak remaining below 6. Hind wing metallic spectrum blue partly changing to paris blue; costa narrowly, a fine terminal line, and cilia black; a submarginal black stripe on inner margin, and a black shade below vein 2 expanding on termen and irrorated with blue; a hyaline streak below cell, and hyaline spots beyond cell above and below vein 5. Wings below with metallic blue on basal half.

Expanse.—31 mm.

Habitat.—Tabernilla, Panama.

Type.—Cat. No. 25893, U.S.N.M.

Collected by A. Busck.

Differs from *L. cucadma* Druce by the reduced hyaline fascia on fore wing and the entirely blue hind wing.

CHLOROSTOLA ANUSIA, new species.

Male.—Black; antennae tipped with white; a white point above eye; tegulae with white dorsal points and lateral white spots; white spots on shoulders; bluish white points on patagia; coxae white; abdomen with dorsal white points on first two segments, slight light blue subdorsal marks on other segments; similar points laterally and sublateral white spots on first three segments, the following segments laterally and ventrally also the last segment above rufous, the latter with a black dorsal line. Fore wing with antemedial metallic dull deep yellow green band; two slight hyaline streaks in middle of cell and a spot below it; two spots towards end of cell and a speck above base of vein 2; a fine green line on discocellular; four hyaline spots beyond cell followed by a metallic dull deep yellow green space in-bent below vein 3 to middle of inner margin. Hind wing with hyaline patch in end of cell, a large spot below cell, and a small spot on inner area; two conjoined spots beyond the cell.

Expanse.—42 mm.

Habitat.—Cordoba, Mexico.

Type.—Cat. No. 25894, U.S.N.M.

Only differs from *C. corydon* Druce in the rufous terminal coloration of abdomen.

AGYETA MACASIA, new species.

Female.—Palpi black, first segment below scarlet red. Head black; frons edged with white; vertex behind and neck scarlet red. Collar black tinged with cyanine blue. Thorax cyanine blue, the patagia black. Abdomen above cyanine blue, with upright lateral black lines; underneath pale cerulean blue. Legs fuscous, the tarsi tinged with parula blue. Fore wing blue black; a hyaline streak in cell along median, not reaching base, subcostal, or end, its upper edge rounded terminally; a narrower streak below cell from nearer base; a large spot between veins 2 and 3, diverging from vein 3 and not reaching termen; an oblique semi-hyaline white spot towards apex cut by vein 5; a cyanine blue streak from base above and below submedian; cilia black. Hind wing black shot with cyanine blue, faintly showing a slightly hyaline streak on underside below cell from base to near termen. Fore wing below duller; a fine blue streak on costa and one in cell below subcostal.

Expanse.—27 mm.

Habitat.—Below Macas, Ecuador.

Type.—Cat. No. 25895, U.S.N.M.

Received from Mrs. E. W. Rorer.

DELPHYRE NILAMMON, new species.

Male.—Head and thorax drab gray; palpi darker in front, blackish at sides and behind; antennae black with white tips; frons medially white; white tufts at base of antennae and a white streak on shaft at base; back of head orange; blackish spots on collar, and similar streaks on edge of patagia. Abdomen light orange yellow above, the last two segments black; anal segment white medially, fuscous laterally; underneath the last three segments black; a lateral black line; tibiae and tarsi black; coxae light orange yellow. Fore wing pale drab gray; a fuscous streak at base of costa and blackish line from base of inner margin suffusing with postmedial line at middle of margin; an antemedial fuscous line from median, outangled at fold; two fuscous lines in outer half of cell, the upper line divided by a small drab shade; a small fuscous spot beyond discocellular and elongated spots from cell between veins 2 to 5, the longest between veins 3 and 4; a fuscous postmedial line from a blackish spot on costa, outcurved, suffusing with the postcellular spot below vein 4, apparent again from middle of spot above vein 2 and in bent to middle of inner margin; three subterminal fuscous spots from costa, and much smaller spots above and below vein 2 and above vein 1; a streak on inner margin to tornus; large terminal spots, suffusing at apex; the spot between veins 2 and 3 reduced to a streak. Hind wing whitish, the outer and inner margins broadly fuscous black.

somewhat narrower between veins 2 and 5. Fore wing below white without basal markings, the discal spots suffusing and joining the tornal spot; apex broadly fuscous black from above vein 3. Hind wing below with the costa also fuscous black.

Expanse.—40 mm.

Habitat.—Rio Potaro, British Guiana.

Type.—Cat. No. 25896, U.S.N.M.

In appearance very much like *Eucereon inconspicua*, female, Lathy figured by Hampson,¹ but the venation is of course different.

HELIURA NATHALAN, new species.

Female.—Antennae black, the base and a short streak on shaft cream white. Palpi fuscous black in front, otherwise black. Head and thorax light drab; back of head orange; tegulae and patagia edged with black; metathorax buff yellow. Abdomen fuscous black, the subdorsal hairs blue black; the fifth and sixth, also front of seventh segment buff yellow; underneath buff yellow except on two last segments; legs black; coxae buff yellow. Fore wing cream buff faintly tinged with gray, the markings black except a buff yellow spot at base followed by a black line expanding to base on inner margin and toothed on vein 1; a spot on costa and one in cell before middle; a faint line from origin of vein 2 to fold, then inbent and thick; a bar from costa across discocellular, followed by irregular spots forming a postmedial series, vertical to vein 3, inbent from 3 to 2, outangled on vein 1; a broad subterminal line from costa to vein 5; blackish marginal suffusions at apex; an upright bar between veins 3 and 5, and an inangled spot below vein 2. Hind wing fuscous black; basal half of costa whitish. Wings below fuscous black; fore wing with some white in cell, and a streak below it from base; two postmedial white spots between veins 5 and 7, and two spots outset between 3 and 5; hind wing with the cell and a streak below it white.

Expanse.—36 mm.

Habitat.—Rio Potaro, British Guiana.

Type.—Cat. No. 25897, U.S.N.M.

I can not compare this to any other species.

HELIURA CADROE, new species.

Male.—Antennae fuscous. Head and thorax drab gray; a small blackish spot on vertex; peach red spots behind head; patagia behind blackish, the dorsal edge of patagia broadly so; dark lines on shoulders, and a short line on patagia outwardly; some white on metathorax. Abdomen fuscous black; traces of fine scarlet segmental lines on terminal half; anal hairs buff white. Legs mostly

¹ Lep. Brit. Mus. supplements, vol. 1, pl. 19. fig. 20

fuscous; coxae light pink. Fore wing drab gray, the markings black; basal, antemedial, postmedial, and subterminal streaks on costa; a black streak at base below cell outwardly downcurved; a streak on submedian fold, and a broad oblique streak at base below submedian; a short antemedial streak on inner margin, slightly upbent with a small spot just beyond above vein 1; a round spot in middle of cell; a small spot at lower angle of cell, and a larger spot above it; a spot beyond cell between veins 5 and 6, and a small spot above 6; a spot below vein 3 at cell, one below vein 2 and a streak on inner margin; elongate streaks between veins 3 and 5 and spots below vein 2 and at tornus; large subterminal spots from costa to below vein 6; terminal spots, large at apex, decreasing to a point below vein 2. Hind wing black; base of costa, cell, and a streak below cell whitish. Fore wing below black; a white spot in cell, and a large spot below it; postmedial white spots from vein 8 to 5, and outset from vein 5 to tornus. Hind wing below with the costa black.

Expanse.—36 mm.

Habitat.—Potaro River, British Guiana.

Type.—Cat. No. 25898, U.S.N.M.

Near *H. thysbodes* Dognin.

EUCEREON DUTHACA, new species.

Male.—Palpi deep mouse gray, the first joint whitish in front. Head, collar, thorax, and fore wings light cinnamon drab; two faint pale ochreous spots behind vertex; a fine black medial line from head to metathorax; faint fuscous spots on tegulae; black lines on either side of patagia. Abdomen above scarlet; a fuscous black dorsal patch on three basal segments; anal hairs black; a broad black lateral line; underneath pale salmon color, the last segment partly black. Legs drab gray streaked with deep mouse gray, the tarsi black; coxae pale salmon color, the fore coxae only partly so. Fore wing: a black antemedial line thick and outbent on costa, curved, fine, and deeply inbent to fold with a projecting line to a black angled basal line below cell, from the fold it is again outbent to above submedian, bifurcating shortly at its tip; a curved black line along inner margin to near termen; a quadrate black spot in middle of cell, its lower edge outbent to a black discocellular line; a short fuscous streak medially below cell; veins from cell streaked with fuscous; a very fine double, fuscous, postmedial line, outcurved beyond cell, the inner line starting from a black spot on costa, the outer line from vein 7, obsolescent below vein 3; a postmedial and a subterminal thick short black streak between veins 2 and 3; a subterminal dentate fuscous black line from vein 8 to vein 5, and fuscous streaks on submedian vein and below it; marginal fuscous

black streaks on interspaces. Hind wing fuscous black terminally, paler shaded towards base, the cell and space just beyond almost semi-hyaline whitish. Fore wing below fuscous black, the inner margin faintly whitish; a white spot in cell towards discocellular; postmedial white spots between veins 5 and 8 and subterminal white spots between veins 5 and 3. Hind wing below whitish, the veins and margins fuscous black.

Expanse.—39 mm.

Habitat.—São Paulo, South East Brazil.

Type.—Cat. No. 25899, U.S.N.M.

Received from H. von Ihering.

The markings very similar to those of *E. complicatum* Butler.

EUCEREON THEOPHANES, new species.

Male.—Antennae black, the shaft on terminal half grayish olive. Palpi black, in front deep grayish olive; some white at base of first joint. Frons blackish; vertex drab with a large black spot; orange spots behind; tegulae grayish olive, broadly black behind; thorax black with grayish olive hairs in front and on metathorax, the latter tipped with yellow; grayish olive streaks on patagia and a line on shoulders outwardly edged with orange yellow. Abdomen above black to beyond middle then orange yellow, part of last segment and anus black; a broad lateral black line; underneath light orange yellow, the last segment black. Legs fuscous black, the coxae white. Fore wing pale drab gray, the costal and inner margins and veins olive ochre, the spots black; base consisting of spots increasing in size to inner margin, interrupted at base of median by a small ochraceous spot; antemedial spots on costa, below cell, and above submedian; a medial point in cell and spots above and below vein 1; a large irregular spot at end of cell, a streak above it on costa, and an oblique spot below it between veins 2 and 3, another spot below this and a streak on inner margin; a spot beyond discocellular and a point above vein 6; elongated spots between veins 5 and 3 at cell, the lower spot the longer with a small spot below vein 2; subterminal large spots from costa to vein 5; terminal spots, the smallest between veins 2 and 4, and 5 and 6. Hind wing with the basal half semi-hyaline white, the outer and inner margins broadly black. Fore wing below black; a quadrate medial white spot in cell, and a large spot below it joining the white inner margin; postmedial white spots from vein 8 to vein 2, those between 2 and 5 outset. Hind wing below with the costa black.

Expanse.—31 mm.

Habitat.—Rio Potaro, British Guiana.

Type.—Cat No. 25900, U.S.N.M.

In appearance of wings somewhat like *Heliura thysbodes* Dognin.

EUCEREON CYNEBURGE, new species.

Female.—Palpi white, the second joint with a broad black band, the third joint with a black ring at base, the tip yellowish. Head white faintly tinged with yellow; a short oblique black line on frons laterally; a black point on vertex. Tegulae and thorax white; triangular black spots posteriorly on collar, similar spots on shoulders, and a short streak on dorsal side of patagia. Abdomen above light orange yellow, the dorsum broadly fuscous at base, narrowing on following segments, the edges saw shape, the anal and previous segment entirely light orange yellow; a lateral fuscous line; underneath white. Legs white, the tibiae and joints streaked with fuscous black, also similar shading on fore coxae; fore and mid tarsi black, hind tarsi white. Fore wing white, the veins pallid purplish gray, the markings black; four spots on costa; a subbasal triangular mark below cell, and a short line on inner margin; antemedial points below median and above submedian, an inset streak below submedian; two inversely semilunar lines at middle of cell and two small spots at end of cell; a postmedial series of points inbent to middle of inner margin from below vein 7, the point below vein 4 outset; an irregular outer series of short streaks and points, the streaks below veins 3, 6, and 7; a small subapical spot above vein 7; terminal points above tornus forming a short thick streak. Hind wing light cinnamon drab, the base and just beyond cell whitish. Fore wing below white, the veins fuscous, also a round spot in middle of cell, a large spot over discocellular and the base of interspaces between veins 3 and 5; the outer spots fuscous mostly suffusing, the terminal spots as above. Hind wing below with the whitish portion more distinct and extending to inner margin and near anal angle.

Expanse.—43 mm.

Habitat.—West Indies without precise locality.

Type.—Cat. No. 25901, U.S.N.M.

Nearest *E. ochrota* Hampson.

EUCEREON CHOSICA, new species.

Male.—Body and wings avellaneous; yellow streaks on tegulae, shoulders and dorsal side of patagia; tip of abdomen yellow. Abdomen below whitish on middle segments. Fore wing: faint tilleul buff streaks on interspaces postmedially forming a curved shade beyond cell which is followed by a darker shade; a dark spot on discocellular; a subterminal tilleul buff line. Hind wing thinly scaled buffish white suffused on outer half with avellaneous. Wings underneath avellaneous, the fore wing with a quadrate white spot beyond cell between veins 5 and 7, the hind wing somewhat whitish in disk.

Expanse.—30 mm.

Habitat.—Chosica, Peru.

Type.—At Cornell University.

Collected, May 25, 1920, at Chosica, Peru, by the Cornell University Expedition.

The female is larger and darker, the markings similar to the male.

Expanse.—40 mm.

Paratype.—Cat. No. 26167, U.S.N.M.

The Museum is indebted to Cornell University for the paratype. The species is allied to *E. costulatum* Herrich-Schaeffer.

PROPYRIA MORELOSIA, new species.

Male.—Head, body, and legs silky black. Fore wing carmine, the margins black, narrow at base of costa expanding slightly before middle of wing, on inner margin narrow on basal fourth, then obliquely expanding to vein 3 at lower angle of cell; the carmine space is slightly constricted beyond cell, then somewhat spatulate. Hind wing black, the costal margin, cell, and a streak below cell carmine, the apex remaining black. Fore wing below as above, the veins from middle of wing to black terminal margins olive gray, the black below cell and veins 2 and 3 reduced to irrorations. Hind wing as above.

Expanse.—24 mm.

Habitat.—Morelos, Mexico.

Type.—Cat. No. 25902, U.S.N.M.

PROPYRIA FRIDOLINIA, new species.

Female.—Head and body fuscous black; shoulders and patagia maize yellow. Fore wing fuscous black; costal margin broadly maize yellow from base to beyond end of cell, its end oblique, the yellow below subcostal not reaching end of cell. Hind wing cadmium yellow, the termen broadly black, its inner edge sinuous; inner margin with a few black scales. Fore wing below light orange yellow from costa to well below cell; outer margin broadly black, projecting above submedian toward base; inner margin whitish yellow to beyond middle. Hind wing below as above.

Expanse.—22 mm.

Habitat.—Volcan Sta Maria, Guatemala.

Type.—Cat. No. 25903, U.S.N.M.

Family ARCTIIDAE.

SUBFAMILY LITHOSIINAE.

PROGONA RIOMA, new species.

Male.—Head, body, and fore wing deep brownish drab.

Hind wing fuscous.

Expanse.—20 mm.

Habitat.—Vera Cruz, Mexico.

Type.—Cat. No. 26055, U.S.N.M.

Collected by H. Schwarz.

PROGONA IGNATA, new species.

Male.—Palpi, head thorax, abdomen, and hind wing benzo brown; tegulae light buff; anal segment and hairs ochraceous buff. Fore wing light drab, a whitish line along costa.

Expanse.—13 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 26056, U.S.N.M.

Near *P. xanthura* Schaus.

CRAMBIDIA CINNICA, new species.

Male.—Head, collar, and thorax ecru drab. Abdomen drab gray, the anal hairs light buff. Fore wing drab, the veins finely light buff. Hind wing smoky drab; cilia tipped with whitish.

Expanse.—23 mm.

Habitat.—Tampico, Mexico.

Type.—Cat. No. 26057, U.S.N.M.

Collected by Dr. E. A. Schwarz.

ILEMA ARMOGASTES, new species.

Female.—Palpi fuscous. Head, collar, thorax, and fore wing mouse gray irrorated with white scales; cilia mottled with white. Abdomen and hind wing drab gray. Fore wing below drab gray with some white irrorations on costa and termen. Hind wing below with grayish white irrorations on terminal half.

Expanse.—35 mm.

Habitat.—Baguio, Benguet, Philippine Islands.

Type.—Cat. No. 26297, U.S.N.M.

Collected by C. F. Baker.

Comes near *I. basinota* Moore.

DISOIDEмата NICEPHORA, new species.

Male.—Palpi fuscous; head light buff; tegulae white; thorax and abdomen light buff; anal hairs pale ochraceous buff. Fore wing white suffused with light ochraceous buff on costa, on terminal interspaces, on base of inner margin and below end of cell and vein 2; antemedial and postmedial diffuse lines, the former outcurved from near base of costa across cell to median and vein 2 where it is downbent to inner margin before middle, the postmedial outbent from costa above middle of cell, almost vertical from vein 6 to vein 3, slightly upturned along 3 not reaching cell, and downbent to inner

margin; a fuscous point on discocellular. Hind wing white. Fore wing below white; a black streak on costa at base; a fuscous patch beyond cell from vein 11 to vein 3; a tuft of long black hairs on inner margin. Hind wing below white.

Expanse.—15 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 26058, U.S.N.M.

AGYLLA TYGRIUSA, new species.

Male.—Palpi mouse gray fringed with white. Head, collar, and thorax deep quaker drab; a white point on frons; collar finely edged with white except behind. Abdomen white, the anal tufts pinkish buff; legs whitish, the fore and hind tibiae and tarsi streaked with fuscous black. Fore wing broad; apex acute; outer margin straight, rounded at tornus; inner margin slightly rounded; costal half cream white; space below cell and vein 2 to inner margin, also interspaces between veins 2 and 4 to near termen deep quaker drab. Hind wing longer than fore wing, white. Fore wing below cream color; termen obliquely from apex to middle of inner margin fuscous black, its proximal edge shortly cut by paler veins, the scaling thick like fine androconia. Hind wing below white.

Expanse.—32 mm.

Habitat.—Rio Pescado, Ecuador.

Type.—Cat. No. 26298, U.S.N.M.

Can be placed near *A. meteura* Hampson.

PARAONA HAMPSONI, new species.

Male.—Head, thorax, and fore wing dull grayish brown very faintly glossed with blue. Palpi except at tips, pectus, femora, and ventral surface of abdomen light salmon orange; tegulae english red. Abdomen above and hind wing dark mouse gray. Tibiae and tarsi grayish black. Wing below dark mouse gray.

Expense.—Male, 45 mm; female 50 mm.

Habitat.—Mount Omei, Szechuen, China.

Type.—Cat. No. 26299, U.S.N.M.

This species is evidently the same as *P. staudingeri* Hampson not Alpheraky. The true *staudingeri* has the wings deep green, almost black, the veins distinct; veins 4 and 5 on hind wing are from angle of cell and not stalked as in *P. hampsoni*.

Both species received from D. C. Graham.

PARAONA GRAHAMI, new species.

* *Male*.—Palpi light buff streaked with gray and tipped with black. Frons drab gray, vertex whitish. Tegulae and thorax light drab, the metathorax whitish. Abdomen white; legs pale drab gray.

Fore wing olivaceous drab, paler on costa; base of costal edge black; a small smoky spot on costa above end of cell with a very faint oblique shade from it around cell, more distinct and downturned from vein 3 to inner margin; a faint pale almost whitish subterminal shade parallel with termen preceded by some dark shading except on costa. Hind wing above and below white. Fore wing below hair brown, the costa narrowly, the termen broadly cream color.

Expanse.—35 mm.

Habitat.—Mount Omei, Szechuen, China.

Type.—Cat. No. 26300, U.S.N.M.

Collected by D. C. Graham.

CISTHENE DUCEI, new species.

Male.—Antennae, frons, body below and legs blue black; vertex and tegulae orange; thorax black with light orange yellow hairs on metathorax. Abdomen above blue black with transverse orange yellow segmental lines. Fore wing black faintly tinged with blue, the two lines light orange yellow; the medial line two mm. wide, straight, vertical from subcostal to inner margin, and a short streak above subcostal; subterminal line curved, slightly narrower than medial line and ending in a point at tornus. Hind wing black; a broad orange yellow fascia on basal half from costa to inner margin, leaving only the base black. Underneath the yellow fascia on hind wing is cut by black lines on subcostal and median into three spots, the costal spot medial and small.

Expanse.—35 mm.

Habitat.—Between Rio Tocario and Rio Upia, Colombia.

Type.—Cat. No. 26060, U.S.N.M.

Collected by Terry Duce.

Near *C. uncinata* Hampson.

PACHYCEROSIA COLMANA, new species.

Female.—Palpi black; frons deep mouse gray; vertex, tegulae, and thorax whitish gray irrorated with fuscous black. Abdomen above deep mouse gray, underneath and anal hairs buff white. Fore wing pale drab gray irrorated with fuscous black scales; basal edge of costa black; a short subbasal black streak on subcostal vein; an antemedial small black spot on costal edge and a larger spot below it from which a very fine and indistinct line is outcurved across cell and slightly inbent to inner margin; a small medial spot on costa and a large black point at lower angle of cell; a postmedial spot on costa and from it a fine line outbent to below vein 8, then wavily dentate and vertical to inner margin; faint subterminal markings, more distinct at veins 7, 4, and 3; a small black spot on termen above tornus; cilia crossed by a dark line. Hind wing deep mouse gray;

cilia paler crossed by a dark line. Fore wing below deep mouse gray, the cilia as above. Hind wing below light quaker drab.

Expanse.—16 mm.

Habitat.—Mount Makiling, Luzon, Philippine Islands.

Type.—Cat. No. 26301, U.S.N.M.

Received from C. F. Baker.

DARANTASIA PALLADIA, new species.

Male.—Head, collar, and thorax light orange yellow; a black streak between antennae, large spots on tegulae, patagia and meta-thorax. Abdomen above blue black; segmental orange yellow lines at base and on three terminal segments; underside similar, the anal hairs yellow; legs mostly orange yellow, the fore tarsi mostly black, the hind tibiae with black streak. Fore wing black with light orange yellow markings; an elongated subbasal spot covering base of cell, and a triangular spot between fold and submedian; medial and post-medial elongated spots below costa; a wedge-shaped spot above inner margin; a long wedge-shaped spot from below cell antemedially to near subterminal band, its upper edge straight; a subterminal band between veins 7 and 2 ending in a point below. Hind wing velvety black; basal half of costa, an elongated spot from below middle of cell, a marginal spot before anal angle which it reaches narrowly on termen and a faint subterminal spot below vein 6 orange buff with some black irrorations. Fore wing below as above. Hind wing below light orange yellow; costa narrowly, termen somewhat more broadly, a vertical line from costa before apex to termen on vein 5, a streak in cell and a broad fascia from base below cell to termen bifurcating at anal angle black.

Expanse.—22 mm.

Habitat.—Mount Makiling, Luzon, Philippine Islands.

Type.—Cat. No. 26302, U.S.N.M.

Received from C. F. Baker.

Allied to *D. cuneiplena* Walker.

DARANTASIA ? RUMOLDA, new species.

Female.—Antennae blue black, the tips white. Head, body, and fore wing hair brown, the hind wing paler tinged with dark gray.

Expanse.—17 mm.

Habitat.—Cayamas, Cuba.

Type.—Cat. No. 26303, U.S.N.M.

Collected by E. A. Schwarz.

The venation agrees with *Darantasia* except that the specimen is a female and veins 3 and 4 on hind wing are coincident, not stalked as is usual in the females of the genus. The antennae are slightly dilated and minutely serrate.

CARILEPHIA, new genus.

Female.—Proboscis fully developed; palpi slender upturned barely reaching frons; antennae minutely ciliated; hind tibiae with spurs moderate; fore wing long and narrow, the termen oblique; vein 2 well before end of cell; 3 and 4 stalked; 5 from well above angle; 6 from upper angle; 7 and 8 stalked; 9 absent; 10 and 11 free or from a point. Hind wing: costa straight, termen rounded; vein 2 from well before angle; 3 and 4 coincident; 5 from well above angle; 6 and 7 stalked; 8 from middle of cell.

Type of genus.—*C. monnina* Schaus.

Differs from *Heliosia* Hampson in the absence of vein 9.

CARILEPHIA MONINNA, new species.

Female.—Palpi ochraceous with some fuscous hairs. Head, collar, and thorax ochraceous buff; spots on thorax and shoulders, also tips of patagia dull black. Abdomen above hair brown suffused with black terminally; underneath and legs light buff, the fore tibiae streaked with hair brown, the fore tarsi hair brown with a light buff ring. Fore wing light ochraceous buff, the markings fuscous black; a subbasal line from costa to below cell; an antemedial line outangled in cell, interrupted on fold and not reaching inner margin; a broad vertical medial line; a spot towards end of cell, and one on discocellular; a spot from vein 2 at cell, expanding, distally indented; a broad postmedial line, slightly curved, somewhat constricted beyond cell, widest at vein 2; termen, a subapical streak, and a spot on veins 3 and 4 suffusing with termen. Hind wing hair brown suffused with fuscous black on terminal half. Wings below smoky hair brown, the inner margin of fore wing and costa of hind wing ochraceous buff.

Expanse.—21 mm.

Habitat.—Mount Makiling, Luzon, Philippine Islands.

Type.—Cat. No. 26304, U.S.N.M.

Received from C. F. Baker.

VULMARA, new genus.

Female.—Proboscis fully developed; palpi upturned, slender, not reaching vertex; antennae pubescent; tibiae with the spurs moderate. Fore wing narrow, the costa straight; vein 2 from towards angle; 3 from before angle; 4 and 5 from angle; 6 from upper angle; 7, 8, 9, stalked, 7 beyond 9; 10 and 11 free. Hind wing with vein 2 from beyond middle of cell; 3, 4 coincident from angle, 5 from angle; 6 and 7 stalked; 8 from before middle of cell.

Type of genus.—*Vulmara drostana* Schaus.

Can be placed near *Halone* Walker.

VULMARA DROSTANA, new species.

Female.—Head, body, legs, and hind wing fuscous hair brown. Fore wing hair brown, faintly tinged with purplish.

Expanse.—18 mm.

Habitat.—Chejel, Guatemala.

Type.—Cat. No. 26305, U.S.N.M.

EUDOLICHE OSVALDA, new species.

Female.—Palpi and head white; a few brown scales on palpi. Collar, thorax, and abdomen pale drab gray. Fore wing drab gray, the costa white not sharply indicated. Hind wing white.

Expanse.—24 mm.

Habitat.—Baracoa, Cuba.

Type.—Cat. No. 26061, U.S.N.M.

This species has longer, narrower wings than typical *Eudoliche* and vein 11 on fore wing anastomoses with 12, otherwise the venation is the same.

THYONE THEODULA, new species.

Male.—Palpi and lower part of frons pale yellow orange; head otherwise, tegulae, patagia, and fore wing bittersweet orange; abdomen above and hind wing strawberry pink; abdomen below and legs pale yellow orange; fore tarsi blue black at base and tips, the end of hind tibiae and tips of tarsi black. Fore wing: a subbasal black spot on median shot with dark metallic blue; black lines, partly tinged with dark blue, on subcostal, median and submedian veins from antemedial space to near termen, the upper line expanding at outer end, the line on median slightly dilated at outer end, the line on submedian dilated at both ends; an oblique black line on costa from middle to vein 10; cilia deep mouse gray. Hind wing: cilia mouse gray at apex, otherwise light gray.

Vein 11 on fore wing free.

Expanse.—18 mm.

Habitat.—Chejel, Guatemala.

Type.—Cat. No. 26059, U.S.N.M.

ILLICE BONITENSIS, new species.

Male.—Head, collar, thorax, and fore wing drab gray; front of collar and neck flesh color. Abdomen flesh color. Hind wing flesh color, the termen broadly drab gray, narrowing at anal angle. Fore wing below drab gray; a flesh color streak below costa on basal half. Hind wing below whitish buff suffused with flesh color on costal and inner margins, the termen as above.

Expanse.—13 mm.

Habitat.—Bonito, Province of Pernambuco, Brazil.

Type.—Cat. No. 26306, U.S.N.M.

JORGENSENIA, new genus.

Male.—Antennae with rather long pectinations ending in a long cilia, the pectinations shortly ciliated; female antennae serrate with short bristles. Palpi obliquely upturned reaching above vertex, smoothly scaled. Legs smooth; hind tibiae with two pairs of short spurs. Body smooth. Fore wing: costa almost straight, outer margin oblique; vein 2 from towards angle of cell; 3 from close to angle; 4 and 5 on short stalk; 6 from upper angle; 7, 8, 9 stalked, 7 before 9; 10 from cell; 11 anastomosing with 12. Hind wing: veins 2 and 3 stalked from angle of cell; 4 absent; 5 from just above angle; 6 and 7 coincident.

Type of genus.—*Jorgensenia cunegunda* Schaus.

JORGENSENIA CUNEGUNDA, new species.

Female.—Body and wings above black suffused with dusky green. The wings below duller.

Expanse.—32 mm.

Habitat.—Esquina Grande, Argentine Republic.

Type.—Cat. No. 26054, U.S.N.M.

Received from Don Pedro Jorgensen.

TALARA THEA, new species.

Male.—Head, collar, and thorax light mouse gray. Abdomen black. Fore legs black, coxae and hind legs white, the hind tibiae and tarsi tipped with black. Fore wing grayish white; a streak in cell, and broad postmedial space from vein 6 to inner margin black; inner margin broadly black; termen narrowly black, costa finely black except on medial space; cilia black. Hind wing black. Wings below black, the apex of fore wing rather broadly white, the cilia remaining black.

Expanse.—20 mm.

Habitat.—Ecuador.

Type.—Cat. No. 26307, U.S.N.M.

ASURA MODVENA, new species.

Male.—Palpi fuscous. Head, collar, and thorax maize yellow; a black point on shoulders, black tips to collar medially and a point on patagia. Fore wing maize yellow, the markings black; a double basal streak in cell, a streak on basal third of costal edge; in bent antemedial spots above subcostal vein and in cell, an inset spot below cell, an outset spot above submedian and an inset spot below it; a medial line incurved from costa to end of cell at vein 3, then outcurved to submedian and in bent; postmedial line remote sinuous from below costa with short projecting lines on veins 8, 6, and 4

almost touching the black terminal line, below vein 3 incurved and suffusing with terminal line at tornus; cilia whitish with some brown at base. Hind wing thinly scaled, yellowish white; a dusky shade on termen from apex to vein 3. Wings below whitish yellow; fore wing with markings similar, smoky black, the outer line connected with a black spot on costa; hind wing with the terminal shade distinct, black.

Expanse.—14 mm.

Habitat.—Mount Makiling, Luzon, Philippine Islands.

Type.—Cat. No. 26308, U.S.N.M.

Received from C. F. Baker.

SCHISTOPHLEPS HEDDA, new species.

Male.—Head, body, and legs white; extremity of fore tibiae and fore tarsi suffused with drab. Wings white, thinly scaled. Fore wing with markings light ochraceous buff; a spot at base below cell; a series of four antemedial spots deeply outcurved; medial spots outbent on costa then vertical to inner margin, the spots more widely separated in cell and above submedian, those on costa suffusing to cell; a spot in end of cell; postmedial spots outbent on costa and suffusing, then downbent to tornus, between veins 3 and 5 expanding to cell; marginal spots from above vein 6 to vein 3.

Expanse.—17 mm.

Habitat.—Mount Makiling, Luzon, Philippine Islands.

Type.—Cat. No. 26309, U.S.N.M.

Received from C. F. Baker.

Can be placed near *S. albida* Walker.

What is probably the female of this species has the spots much reduced and evanescent, the antemedial spot on submedian obsolete, the postmedial spots outcurved and inbent to inner margin; a series of subterminal spots emitting streaks on veins to smaller terminal spots, these also connected on termen by a fine terminal line.

Expanse.—21 mm.

Habitat.—Baguio, Benguet, Philippine Islands.

In case this female is distinct I suggest the name of *heddina* for it.

Received from C. F. Baker.

CAULOCERA ALIBA, new species.

Male.—Head, collar, thorax, and abdomen white; faint yellowish suffusions on vertex and tegulae; abdomen dorsally shaded with drab gray. Fore wing white; some pale smoke gray shading at base followed by a blackish line on cellular fold, the other markings antimony yellow; three oblique elongated spots before middle of costa to subcostal vein; a large quadrate spot from cell and vein 2 to inner margin; a postmedial fascia outcurved around cell, expanding from

veins 6-2 basad to cell, below vein 2 consisting of a fine vertical line to inner margin, closely followed below vein 5 by an oblique spot to near termen below vein 3; a large spot at tornus; a small spot on costa before apex. Hind wing white, thinly scaled; a terminal pale smoke gray shade on termen from apex to vein 3, darkest on veins; inner margin faintly suffused with light buff.

Expanse.—14 mm.

Habitat.—Mount Makiling, Luzon, Philippine Islands.

Type.—Cat. No. 26310, U.S.N.M.

Received from C. F. Baker.

Allied to *C. crassicornis* Walker.

CHAMAITA EDELBURGA, new species.

Female.—Head, body, and legs white; light pale suffusions on tegulae and patagia; fore and mid tarsi pinkish buff. Fore wing white, thinly scaled, the markings pinkish buff; a narrow subbasal fascia from subcostal to inner margin; a sinuous antemedial line interrupted above fold; a small medial spot in cell; postmedial line outbent from costa before end of cell, curved around cell to vein 2, interrupted on fold and outbent below it; subterminal line more maculate, slightly sinuous; terminal elongated spots on veins. Hind wing white, semihyaline, the costa tinged with opalescent pale vinaceous lilac, the rest of the wing tinged with light sky blue.

Expanse.—23 mm.

Habitat.—Mount Makiling, Luzon, Philippine Islands.

Type.—Cat. No. 26311, U.S.N.M.

Received from C. F. Baker.

HEMIPSILIA GRAHAMI, new species.

Male.—Head, collar, and thorax maize yellow. Abdomen above and legs light buff; abdomen below white. Fore wing maize yellow the markings warm buff; a subbasal spot below cell; an antemedial line, almost medial, outangled at median and vein 2; a small spot near end of cell; a postmedial macular fascia, its outer edge evenly curved, its inner edge projecting basad on interspaces; subterminal spots even on proximal side projecting on terminal side. Hind wing semihyaline white faintly suffused with yellow.

Expanse.—22 mm.

Habitat.—Shin Kai Si, Szechuen, China.

Type.—Cat. No. 26312, U.S.N.M.

Received from D. C. Graham.

CYCLOSIELLA PULCHRINA, new species.

Male.—Antennae peach red with a black line on shaft above before tip. Palpi, head, collar, and thorax orange buff, partly suf-

fused with peach red, especially on anterior half of patagia. Abdomen orange pink above, underneath capucine buff; legs outwardly orange pink. Fore wing maize yellow; costa and termen peach red also the other markings; the cell from near base to middle; a basal spot; an antemedial oblique spot from submedian fold to inner margin, a line from it on inner margin connecting with a curved medial spot from below outer half of cell; a spot above outer half of cell suffusing with costal markings; a line along median to the streak on discocellular; postmedial line from upper angle of cell along vein 6 outcurved and inbent below vein 3 to inner margin with lines from it on veins 5 and 3 to lower angle of cell, also suffusing with termen between veins 2 and 3; termen narrowly at apex and cilia maize yellow. Hind wing orient pink; cilia cream color. Fore wing below yellowish suffused with orient pink.

Expanse.—18 mm.

Habitat.—Los Baños, Philippine Islands.

Type.—Cat. No. 26313, U.S.N.M.

Received from C. F. Baker.

TORYCUS DOMINGONIS, new species.

Female.—Head, collar, shoulders, abdomen, and hind wing pallid mouse gray. Thorax fawn color. Legs whitish partly streaked with brownish. Fore wing fawn color thickly irrorated with black and fuscous except on terminal space, the irrorations forming a black subterminal line; two black points on discocellular; a whitish line from base below cell, downcurved to near middle of inner margin.

Expanse.—13 mm.

Habitat.—Santo Domingo, West Indies.

Type.—Cat. No. 26314, U.S.N.M.

Collected by A. Busck.

In *Torycus* the venation of fore wing is similar to *Boenasa* Walker, but the hind wing has all the veins present.

BOENASA TORYCA, new species.

Male.—Palpi, frons, thorax, and patagia dark olive brown. Shaft of antennae, vertex, and tegulae white. Abdomen and hind wing shell pink. Fore wing silky olive brown, the termen suffused with white; a broad white fascia from base below cell filling inner margin to beyond middle, its upper edge curved; a curved fine white line on discocellular distally edged with black; a faint curved outer line consisting of fuscous irrorations. Fore wing below dull hair brown; a fine pink line on discocellular.

Expanse.—17 mm.

Habitat.—Cayamas, Cuba.

Type.—Cat. No. 26315, U.S.N.M.

In appearance like the lithosid genus *Torycus* of Herrich-Schaeffer. My new species of *Boenasa* show the ocelli distinctly and should be removed to the Arctiinae; they are both allied to *B. nigro-rosea* Walker.

BOENASA ANGELICA, new species.

Male.—Antennae with shaft white crossed by dark brown lines. Palpi, frons, and thorax dark olive brown; vertex, collar, and a line on outer edge of patagia shell pink with fine brown irrorations. Abdomen and hind wing grenadine pink. Fore wing silky olive brown; inner margin broadly white, more narrowly at tornus, irrorated with olive brown and partly suffused with shell pink, and a dark oblique line at its base; space above to cell darker shaded with a similar narrow shade extending from it to costa close to apex; some white irrorations on apical half of termen and at tornus. Fore wing below light drab, the inner margin shell pink; a shell pink streak in end of cell.

Expense.—18 mm.

Habitat.—Santo Domingo, West Indies.

Type.—Cat. No. 26316, U.S.N.M.

Collected by A. Busck.

Closely allied to *B. toryca* Schaus.

Subfamily ARCTIINAE.

NERITOS CUCUFAS, new species.

Male.—Palpi light buff; a streak behind and small spots at tips of second and third joints brownish; a fine reddish lateral streak. Frons brownish drab with a small white spot below behind palpi; vertex light orange yellow. Collar and thorax deep brownish drab. Abdomen above brownish drab, underneath white, legs white with light buff tufts. Fore wing deep brownish drab, the markings maize yellow; a large spot from costa medially, slightly constricted to subcostal vein, then irregularly rounded to below cell at vein 2 and across veins 3–5; a small spot at apex; a terminal spot from below vein 5 becoming narrower to vein 2; cilia above vein 5 yellow. Hind wing buff yellow. Fore wing below with the dark portion fuscous.

Expense.—30 mm.

Habitat.—Tumatumari, Potaro River, British Guiana.

Type.—Cat. No. 26317, U.S.N.M.

Looks like a large *Paranerita declivis* Schaus with more extended yellow markings.

NERITOS CYBAR, new species.

Male.—Palpi, frons, and basal joint of antennae eosine pink, the palpi fringed with light ochraceous buff; vertex pale orange yellow. Collar and thorax ocher red, the patagia with a yellow streak. Abdomen above peach red, underneath cream color; legs cream color, fore coxae and tibiae eosine pink. Fore wing cinnamon rufous suffused with carrot red; antemedial and medial small round buff yellow spots, circled with peach red, above and below submedian; a large maize yellow space on middle third of costa extending to vein 2 and vein 4, both sides concave; termen broadly maize yellow narrowing to a point at apex and tornus; postmedial dark space broad on costa, narrowing to a point at vein 4, sometimes the yellow medial patch suffuses with the termen at vein 4, all the dark portions edged with a peach red line. Hind wing cream color. Fore wing below with the dark space at base and along inner margin eosine pink, the apical spot with darker suffusions.

Female.—Fore wing geranium pink, the antemedial and medial small spots as in male; the yellow medial space with edges oblique, the subterminal band equally broad from costa to vein 4.

Expanse.—26 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 26318, U.S.N.M.

PAREVIA VULMARIA, new species.

Female.—Palpi light coral red streaked in front with purple drab. Frons and thorax purple drab; vertex orange buff edged by a red line in front and one behind. Abdomen above light coral red, underneath light buff. Legs maize yellow, the fore legs streaked with red. Fore wing purple drab edged with light coral red from costa antemedially following the contour of the drab space where excurved by the marginal orange buff spots; a spot on costa near middle to within cell, extending narrowly on costa beyond; a minute spot on costa postmedially and a small spot before apex; a spot on termen above vein 4 incurved to near vein 5, then downbent to vein 3 near termen and slightly incurved to tornus; cilia orange buff. Hind wing light coral red; costa narrowly and cilia buff pink. Fore wing below marked as above but more reddish, the marginal spots paler. Hind wing below salmon color.

Expanse.—25 mm.

Habitat.—Rio de Janeiro, Brazil.

Type.—Cat. No. 26319, U.S.N.M.

AUTOMOLIS POSTRADIATA, new species.

Female.—Palpi black; frons black with metallic blue spot; vertex, collar, and thorax orange buff; a black spot on vertex, and fine black

lines edging tegulae dorsally and laterally. Abdomen orange buff; a dorsal triangular black spot on second segment and small paired lines on following segment; terminal three segments black with dorsal metallic blue spots; lateral metallic blue transverse lines edged with black; underneath with narrow black segmental lines. Legs black with orange buff streaks and a spot on fore coxae. Wings orange buff; hind wing with median, veins 2, 3, 5, and a broad streak before inner margin black, also terminal black suffusions between veins 2-5. Underside with the black markings reduced.

Expanse.—42 mm.

Habitat.—La Cumbre, Colombia.

Type.—Cat. No. 26320, U.S.N.M.

Received from E. Phillip.

SORITENA, new genus.

Male.—Antennae shortly bipectinate. Palpi obliquely upturned reaching above vertex, smoothly scaled, the third joint short. Legs smoothly scaled, the hind tibiae with very short spurs. Fore wing moderately broad, the tornus rounded, the inner margin rounded; vein 2 well before angle; 3, 4, 5 slightly apart at lower angle; 6 from upper angle; 7, 8, 9 stalked, 7 before 9; 10 and 11 free. Hind wing; costal margin rounded, also the apex, the costa and upper half of cell clothed below with coarser scales; vein 2 from near base of cell; 3 from angle; 4 and 5 shortly stalked from angle; 6 and 7 coincident; 8 from middle of cell sinuous.

Type of genus.—*S. habanera* Schaus.

Can be placed near *Bertholdia*.

SORITENA HABANERA, new species.

Male.—Head, thorax, and fore wing maize yellow. Abdomen above light orange yellow, underneath light buff. Legs mouse gray. Hind wing white. Fore wing below and costa of hind wing light buff.

Expanse.—29 mm.

Habitat.—Havana, Cuba.

Type.—Cat. No. 26321, U.S.N.M.

AMMALO RAMSDENI, new species.

Female.—Palpi, head, collar, and thorax mouse gray; a scarlet spot behind antennae; some pale ochraceous buff mottling on edge of tegulae; small scarlet tufts on metathorax. Abdomen dorsally suffused with blue black on basal half, with greenish black on terminal half, the basal tufts and underside deep mouse gray. Legs mouse gray, the coxae and tibiae streaked with scarlet. Fore wing pale ecru drab, the veins black except submedian which is light ochreous buff; a small subbasal fuscous spot on costa, and a larger spot below cell; a

medial and shorter postmedial streak on costa light buff, and a similar streak on subcostal from near base to near end of cell; a black streak in cell with semihyaline whitish streaks above and below it; the medial space from cell to submedian semihyaline whitish; very faint traces of fine smoky antemedial and medial lines from cell to submedian; a large fuscous black spot at end of cell and just beyond it, reaching costa above discocellular, and expanding between veins 3 and 5; a fine whitish buff line on discocellular; postmedial semihyaline white spots between veins 5 and 8; a fine black postmedial line from vein 3, inangled on vein 2, then outbent to inner margin before tornus; fuscous terminal streaks on interspaces, short between veins 3 and 5, and 7 and 8, below vein 3 reaching postmedial line; a fine terminal black line. Hind wing hair brown, the cell and a spot below it semihyaline white. Wings below hair brown, the fore wing with postmedial spots as above, and two smaller spots outset between veins 3 and 5 which are only faintly indicated on upper side; the cellular spot on hind wing not reaching base.

Expanse.—36 mm.

Habitat.—Guantanamo, Cuba.

Type.—Cat. No. 26322, U.S.N.M.

Received from Doctor Ramsden.

Looks more like an *Eucereon* than an *Arctian*.

PELOCHYTA NABOR, new species.

Male.—Head and body army brown, the abdomen dorsally clothed with long tiller buff hairs to beyond middle; fore legs darker shaded in front. Fore wing wood brown, the markings fawn color irrorated with fuscous black scales; an oblique shade from base of costa; a broad antemedial fascia with a slight projection on median and vein 2; a patch at end of cell; a postmedial fascia broad at vein 8, inbent to inner margin, constricted between veins 3 and 4; termen irregularly spotted; all the markings very diffuse and sometimes reduced to lines of fuscous black irrorations. Hind wing white; termen from vein 2 to apex, very narrowly avellaneous, also cilia; cilia below vein 2 white. Fore wing below whitish in disk and on inner margin, otherwise wood brown. Hind wing below as above, the costa narrowly wood brown.

Expanse.—38 mm.

Habitat.—Oconeque, Peru.

Type.—Cat. No. 26324, U.S.N.M.

ELYSIUS RUFFIN, new species.

Female.—Palpi and head orange buff, the third joint of palpi light drab. Collar, thorax, and abdomen light orange yellow, the

dorsal hairs flesh color. Legs mostly ochraceous buff, the fore coxae light orange yellow. Fore wing light orange yellow irrorated and striated with orange chrome; the inner margin, an oblique line from base of costa, a broad antemedial fascia oblique from costa, constricted on submedian fold, then downbent, a quadrate patch at end of cell, and termen broadly from post-medial outcurved line suffused with drab gray and edged with hair brown; the terminal area containing an irregular series of large spots of ground color; the fasciae with some drab striae. Hind wing white suffused with flesh color. Fore wing below duller.

Expanse.—45 mm.

Habitat.—Petropolis, Brazil.

Type.—Cat. No. 26325, U.S.N.M.

Collected by Captain W. Robinson.

Allied to *E. sebrus* Druce, differing in the brighter coloring, the constricted antemedial fascia and curved postmedial line.

ELYSIUS MACASIA, new species.

Male.—Head, collar, and thorax brazil red; third joint of palpi, a small spot on shoulder, a dorsal line on thorax and dorsal edge of patagia black. Abdomen above orange buff, the three basal segments clothed with long peach red hairs, with a small round, black, dorsal spot on third segment; other segments with large black dorsal and subdorsal semilunar spots; underneath bittersweet pink. Legs fuscous; fore coxae scarlet, base of legs partly streaked with peach red. Fore wing cameo brown mottled with long, fine, orange buff striae; peach red hairs at base and on basal part of inner margin; a large orange buff antemedial spot from costa to vein 1, an oval spot at end of cell, smaller spots below veins 2 and 3, all orange buff thickly striated and irrorated with scarlet; a similar broad postmedial spot from costa to vein 4, followed by some morocco red spots on interspaces and subterminally between the orange buff striae. Hind wing semihyaline white, the costa, termen narrowly, and cilia, also the inner margin more broadly geranium pink. Fore wing below strawberry pink, the terminal third suffused with roseate brown with ochraceous striae.

Expanse.—60 mm.

Habitat.—Macas, Ecuador.

Type.—Cat. No. 26326, U.S.N.M.

Very similar to *Mazaeras conferta* Walker, but vein 10 free.

AMASTUS VANDREGISILI, new species.

Female.—Palpi carmine, the third joint and tip of second black; frons white; vertex carmine; collar in front and shoulders white edged behind by a fine black line; collar behind, and front of patagia

hazel, the latter becoming hazel behind and tipped with brazil red hairs, a dark line in center, and the dorsal edge with a narrow black edged white line. Abdomen above zinc orange, the basal hairs brazil red; lateral black annuli filled with white; a triangular white spot on last segment edged with black; a sublateral interrupted white line; underneath drab. Thorax below and fore coxae carmine; legs mostly drab, streaked below at base with carmine; mid and hind tarsi streaked below with ferruginous. Fore wing thinly scaled cinnamon brown; cilia on inner margin white on termen tipped with white; a faint smoky fuscous patch on discocellular, and a similar broad postmedial shade, also subterminal darker shading defining a narrow line between them of ground color. Hind wing semihyaline whitish tinged on margins with light ochraceous buff; cilia cinnamon brown.

Expanse.—75 mm.

Habitat.—Ecuador.

Type.—Cat. No. 26327, U.S.N.M.

Can be placed near *E. pseudocollaris* Rothschild.

HALISIDOTA AGATHA, new species.

Male.—Antennae with long pectinations light brown. Palpi, head, and thorax fuscous black; hairs on patagia adjoining wing vinaceous pink basally. Abdomen above fuscous black, the hairs laterally on basal segments sayal brown; underneath suffused with sayal brown. Thorax below and fore legs fuscous black; hind tibiae and tarsi pinkish buff. Fore wing fuscous black, the costal edge and cilia on termen and inner margin warm buff. Hind wing light buff with darker suffusions on termen and a dark line on discocellular. Fore wing below dull brownish drab, the costal edge, subcostal vein and cilia light buff. Hind wing below with the costa broadly brownish drab.

Expanse.—43 mm.

Habitat.—Incachaca, Cochabamba, Bolivia.

Type.—Cat. No. 26065, U.S.N.M.

Unlike any other species.

HALISIDOTA VALENTINA, new species.

Male.—Head, collar, and thorax sayal brown; palpi with a sepia line behind and some ochreous hairs in front especially at base. Abdomen above snuff brown becoming sayal brown terminally; underneath light buff. Legs light buff; fore and mid femora, tibiae, and tarsi streaked with sayal brown. Fore wing sayal brown; an oblique antemedial fascia from costa to median, inset below median and inbent to submedian, a double short streak in end of

cell, and a series of postmedial spots ochraceous buff, the postmedial spot between veins 5 and 6 larger with a narrow fuscous shade extending from it to termen below apex, the other postmedial spots outwardly edged with fuscous scaling; an ochraceous buff streak on costa above discocellular, and a series of subterminal spots partly edged with fuscous; termen narrowly ochraceous buff limited by a wavy brown line. Hind wing bister, the costa and cilia whitish. Wings below drab; fore wing with apical area light drab; the spots light buff; hind wing with a subterminal darker smoky shade at apex, and indistinctly along termen.

Expanse.—42 mm.

Habitat.—St. Jean, French Guiana.

Type.—Cat. No. 26328, U.S.N.M.

Closely allied to *H. cedon* Druce but quite different in color.

HALISIDOTA OROOCA, new species.

Male.—Palpi and frons black; vertex and tegulae honey yellow, the latter with black points; thorax cream buff with a black dorsal line and black streaks on patagia. Abdomen above apricot buff, the base, dorsal tufts, and anal hairs cream buff; a lateral black line; underneath white with a black ventral line. Legs apricot buff, the tarsi fuscous, also the mid and hind tibiae, the latter with a white line; fore coxae honey yellow with black points. Fore wing cream buff with a few black irrorations on outer half, forming faint spots before and beyond discocellular, minute postmedial spots, larger subterminal spots, and small terminal markings, all on interspaces; a black line from near base along median, expanding slightly and ending well beyond cell between veins 4 and 5 with a short streak beyond it above vein 5; a black line on submedian medially. Hind wing thinly scaled smoky fuscous, the median vein broadly, veins 2 to 5, inner margin, costa, and termen narrowly, cream buff. Fore wing below almost as above, but without medial black line on submedian. Hind wing below as above.

Expanse.—35 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 26064, U.S.N.M.

Belongs to the group with moderately pectinated antennae and can be placed near *H. lineata* Schaus.

HALISIDOTA EPHREM, new species.

Male.—Head, collar, and thorax light ochraceous buff with some tawny mottling on upper part of frons, vertex, tegulae, and patagia. Abdomen above warm buff, underneath light buff; fore femora with orange streak, fore tibiae and tarsi suffused with drab. Fore wing

light buff, the veins cinnamon edged above with warm buff, the transverse markings cinnamon, all on interspaces; a fine dark line through cell; small fuscous black spots between costal and subcostal veins; longitudinal lines above and below submedian to postmedial line; a fine outcurved antemedial line; two curved lines medially in cell below subcostal; postmedial space with three rows of deep lunular lines, almost inangled, partly shaded with fuscous; a deeply indentate subterminal line proximally suffused with fuscous; a fine marginal line lunular dentate towards termen; cilia whitish buff. Hind wing thinly scaled white. Fore wing below light buff with a few fuscous lunules postmedially between costa and vein 5, also subterminal fuscous spots from costa to below vein 1. Hind wing below with a postmedial black point on costa.

Expanse.—37 mm.

Habitat.—Rurrenabaque, Bolivia.

Type.—Cat. No. 26329, U.S.N.M.

Collected by Dr. W. Mann.

The antennae are moderately pectinated, vein 10 shortly stalked with 7, 8, 9.

HALISIDOTA DINORA, new species.

Male.—Palpi black with some buff hairs at base. Frons whitish, vertex black; whitish tufts behind antennae, basal joint of antennae orange buff. Tegulae, thorax, and patagia white; black annuli on tegulae and shoulders; an ovate black line on patagia. Abdomen above orange buff; dorsal black spots, larger terminally, containing white scales; lateral triangular white spots edged with black; sub-lateral linear black spots containing each a black point; underneath white with transverse black lines medially and oblique black lines at sides. Legs with black orange and white markings. Fore wing white faintly tinged with buff, the markings fuscous black except a small orange buff spot at base; veins fuscous black; a point at base; a sub-basal curved line; antemedial forming a double series of annuli partly suffusing; medial annuli, large on costa, two in cell; small from vein 3 to vein 1; a postmedial and a subterminal series of annuli, all larger from vein 5 to costa; dark suffusions on interspaces from vein 5 to vein 8 between medial and postmedial annuli, and between the latter and subterminal annuli; cilia black with white spots. Hind wing white, the veins, an antemedial, medial, postmedial, and terminal line benzo brown; inner margin broadly suffused with benzo brown; cilia white. Wings below very similar to upper side.

Expanse.—44 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 26320. U.S.N.M.

Family SATURNIIDAE.

DIRPHIA ORIDOCEA, new species.

Male.—Palpi and head mahogany red. Thorax verona brown with some pinkish buff hairs. Abdomen above black, the base mahogany red; anal hairs and fine segmental lines ochraceous orange; lateral and sublateral round white spots; venter ochraceous tawny; tibiae and tarsi mahogany red. Fore wing verona brown; a large white spot at base from below costal edge to submedian, continued as a line to inner margin, its proximal edge oblique, its distal edge outcurved, partly irrorated with some faint tawny scales; an elongated cream white antemedial spot below cell; a large irregular white spot at end of cell with a broad line projecting from it along vein 5 to beyond postmedial line, containing a large cluster of apricot yellow scales; postmedial line erect, defined by pallid vinaceous drab scaling beyond it which extends to apex and termen from vein 2 to tornus, leaving a curved terminal clear brown space. Hind wing sayal brown with fuscous postmedial and subterminal shades, the latter followed by pallid vinaceous drab scaling not reaching termen; an oval pinkish buff spot over discocellular containing some darker scales. Fore wing below broadly light buff on inner margin, otherwise suffused with brown, the cell fuscous; a pale shade on discocellular; a sayal brown straight postmedial line distally edged with pallid vinaceous drab, and similar subterminal shading as on upper side. Hind wing below sayal brown suffused with pallid vinaceous drab except on costa, medial and postmedial broad lines, a finer subterminal line, lunular between veins 2 and 4, and the termen.

Expanse.—67 mm.

Habitat.—Peru.

Type.—Cat. No. 26351, U.S.N.M.

DIRPHIA BINASA, new species.

Male.—Palpi mouse gray, the fringe below tipped with cinnamon. Frons hair brown, laterally cinnamon. Antennae cinnamon. Body above black with scattered pinkish cinnamon hairs, especially on thorax; patagia mottled with white hairs; anal hairs bittersweet orange; body below and innerside of legs light ochraceous buff, outside of legs black. Fore wing whitish almost entirely effaced by the overlying scales and hairs; costal edge and veins from postmedial line to termen ochraceous orange, and a similar spot at base of inner margin; a black line on fold from base to antemedial line, the space above it mottled isabella color and white, below it mouse gray and white; antemedial line, almost medial, wood brown, double,

whitish between, very dentate and irregular, incurved below cell, outbent on costa, inbent on inner margin; medial space irrorated with isabella color and mouse gray; a large irregular spot from end of cell, almost triangular, its three sides incurved, wood brown darker edged on two sides, from veins 3-4 with black suffusing with a postmedial lunule; a slight wood brown line from costa to upper edge of spot; postmedial line double, lunular, fine from costa to vein 4, below 4 black filled in with orange cinnamon; interspaces beyond irrorated with mouse gray; a white subterminal line straight from costa to vein 4, then lunular; cilia isabella color with white spots at veins and tipped with black at interspaces. Hind wing pale ochraceous buff, the inner margin broadly suffused with salmon color; a large fuscous black spot over discocellular, containing a fine sooty black curved line, suffusing with a coarse black postmedial line; a broad black subterminal band, its outer edge lunular, the veins beyond it orange; marginal interspaces white, thickly irrorated with black; cilia with black spots terminally at interspaces. Wings below light buff irrorated with black, the veins and a terminal line orange buff; a black postmedial line; a subterminal whitish lunular line preceded by thick clusters of black scales; fore wing with an oblique black bar on discocellular, the costa ochraceous orange.

Expanse.—42 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 26071, U.S.N.M.

Comes close to *D. basina* Maassen.

HELICONISA CARILAPHA, new species.

Female.—Palpi black. Head, tegulae, and thorax fuscous, the latter mottled with ochraceous tawny hairs. Abdomen black overlaid with ochraceous tawny hairs. Wings cinnamon drab with irregular short fuscous black streaks on outer half; cilia fuscous black. Fore wing: veins strongly black; an oblique white line on discocellular proximally edged with black on lower half. Hind wing: cell and space below to middle of wing clothed with vinaceous fawn hairs; veins finely black; a large round black spot over discocellular. Wings below buffy brown, the veins and broad lines on discocellulars black.

Expanse.—132 mm.

Habitat.—Montevideo, Uruguay.

Type.—Cat. No. 26352, U.S.N.M.

Received from Dr. F. Felippone.

Family BOMBYCIDAE.

COLLA MANNI, new species.

Male.—Body white; antennae with shaft mottled white and raw sienna, the pectinations of the latter color; edges of frons, a large dorsal spot at base of abdomen, tips of tufts over matathorax, and anal hairs orange citrine, also a few similar hairs on other segments of abdomen dorsally. Legs white, the fore and hind femora and tibiae olive brown. Fore wing white, the disk faintly tinged with hydrangea pink; a silver bar on discocellular; a silver line on submedian fold; costal edge cinnamon buff; a postmedial short, oblique, clay color line on costa, followed by a finer drab gray line to vein 6; a double drab gray postmedial line across vein 5 with short black streaks on vein 5; a subterminal series of drab gray spots on interspaces, obsolescent between veins 3 and 4; similar marginal spots, almost forming a line cut by veins; cilia white with a faint drab gray line at base. Hind wing white, thinly scaled except along inner margin; two orange citrine spots on inner margin; terminal drab gray spots from vein 4 to anal angle. Fore wing below without markings. Hind wing below with two small fuscous spots on inner margin, and a double subterminal spot below vein 2.

Expanse.—25 mm.

Habitat.—Rurrenabaque, Bolivia.

Type.—Cat. No. 26066, U.S.N.M.

Taken by Dr. W. M. Mann on the Mulford Biological Expedition, 1921–1922.

The species comes near *C. gaudialis* Schaus.

Family EUPTEROTIDAE.

APATELODES OLAUS, new species.

Male.—Palpi ochraceous orange. Head mottled tawny and white. Collar and thorax fawn color with some white hairs. Abdomen mikado brown terminally suffused with ochraceous orange. Legs mikado brown, the fore tibiae ochraceous orange. Fore wing fawn color crossed by snuff brown lines; a subbasal line on costa; ante-medial line fine outbent on costa, less so from median vein to inner margin. Medial line broader almost vertical and a similar post-medial line from lower angle of cell to inner margin; some white scales on discocellular, and an oblique line on costa above forming origin of postmedial; a fine outer line outcurved below costa to vein 4 then sinuous; termen from vein 4 to apex tinged with bronzy sayal brown. Hind wing glossy antimony yellow; a faint darker medial and postmedial line. Wings below antimony yellow crossed by

two darker lines, also fine streaks on discocellulars; some white irrorations at apex of fore wing.

Expanse.—40 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 26353, U.S.N.M.

Allied to *A. signata* Druce.

APATELODES SCHREITERI, new species.

Male.—Palpi and head cinnamon rufous. Collar and thorax pale vinaceous fawn; a reddish brown dorsal line from behind head, the thoracic tufts tipped with dark brown and fuscous. Abdomen above vinaceous buff irrorated with black scales; body below russet vinaceous. Fore wing avellaneous suffused with light drab; black irrorations on base; antemedial line fine, fuscous, outcurved from costa, incurved between cell and submedian, preceded by a fuscous spot on inner margin; a very fine postmedial lunular line from a small reddish-brown spot on costa and with similar points on veins, followed by a short natal brown streak below vein 7 ending in a semi-hyaline white spot; a small brown angled spot above vein 7 edging a small white spot and a fine similar line above it; there are faint traces of a line before the postmedial. Hind wing pecan brown; a fine dark postmedial line outwardly edged with buff pink, slightly upcurved below vein 2, and down angled close to inner margin, dividing a ferruginous streak along inner margin; cilia drab. Fore wing below light buff irrorated with hazel; the termen from vein 2 to apex hazel, the subterminal spots at apex white. Hind wing below hazel, the termen broadly and inner margin buff pink irrorated with hazel; a medial ferruginous line closely followed by a fine black line up angled below vein 2 and again downcurved.

Expanse.—30 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 26353, U.S.N.M.

Received from Don Rodolfo Schreiter.

Can be placed near *A. hiantha* Dyar.

OLCECLOSTERA FRIBURGENSIS, new species.

Male.—Palpi above sayal brown; fringe of palpi, collar, thorax, and fore wing pale cinnamon pink irrorated with sayal brown; frons, vertex and dorsal edge of tegulae almost entirely sayal brown. Abdomen dorsally light cinnamon drab irrorated with sayal brown, underneath paler. Legs pale cinnamon pink irrorated with sayal brown, the tarsi fuscous brown. Fore wing with four sayal brown lines, the antemedial, medial, and postmedial straight, parallel, in-bent from costa to inner margin, the subterminal from apex in-bent

to below vein 5 then downbent to vein 2 near termen, this line much straighter than in the allied species, the last two lines edged with whitish proximally; a terminal black line with brown points on veins; cilia white tipped with saccardo's umber; cilia on inner margin saccardo's umber, from base to antemedial white, also at tornus, the latter with a brown line at base; a sayal brown line on costa from base to apex, partly edged in front with white. Hind wing whitish at base to a fine dark antemedial line; a dark line on discocellular; wing beyond vinaceous fawn with a diffused whitish postmedial line expanding towards inner margin; a fuscous terminal line; cilia mottled with white at base and tipped with white. Fore wing below whitish faintly tinged with vinaceous; some dark irrorations at apex; postmedial line distinct, the others indicated in transparency. Hind wing below pale cinnamon pink thickly irrorated with saccardo's umber and fuscous except on inner margin; dark scales on discocellular; a faint medial line; terminal black points on veins.

Expanse.—38 mm.

Habitat.—Nova Friburgo, Brazil.

Type.—Cat. No. 26355, U.S.N.M.

Received from J. Arp.

Allied to *O. ostenta* Schaus, *O. umbrilinea* Schaus, *O. trilineata* Dognin, and *O. hezia* Druce.

O. tanaïs Druce and *O. quadrilineata* Schaus have the hind wing narrower from costa to anal angle.

COLOBATA THEA, new species.

Male.—Palpi, head and collar mottled light buff, drab, and black; a lateral line on palpi and throat fuscous. Shaft of antennae white irrorated with black. Thorax and basal joint of abdomen light buff; patagia white mottled with dark brown scales. Abdomen above drab gray irrorated and mottled with light buff and hair brown, the second and third segments suffused with mikado brown; fine black segmental lines; a lateral wavy black stripe; underneath and legs white thickly irrorated with fuscous scales. Fore wing orange yellow thickly irrorated with buffy brown; basal third of costa and a medial patch white with dark irrorations; some white scaling on and below costa postmedially; a fine fuscous antemedial line, indentate on costa, incurved across cell, angled and more deeply incurved from vein 2 to fold and outcurved across vein 1, inwardly edged with white from costa to median; a vertical buffy brown medial line expanding into a broad shade in cell; postmedial line fuscous outbent on costa to vein 5, vertical to 4, then inbent to inner margin, followed by a fine dark lunular line; some dark shading beyond this last line between veins

6 and 7; a marginal fine lunular line and a dark line along the crenulate termen. Hind wing buffy light yellow; a faint line on discocellular and buffy brown medial line outcurved beyond cell; a finer more evenly curved postmedial line followed by broad drab shading; a fine terminal dark line; cilia broadly tipped with fuscous. Fore wing below buff white, the costa broadly suffused with drab; postmedial line outcurved beyond cell; a fine outer line slightly curved; subterminal crescents between veins 4 and 7 inwardly white edged between veins 5 and 7. Hind wing below buff white thickly irrorated with fuscous; medial line thick, fuscous, outwardly dark shaded; outer line lunular dentate, the shading beyond also dentate; inner margin and termen with fewer irrorations.

Expanse.—40 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 26356, U.S.N.M.

Very near *Colobata lineosa* Walker but with the termen of fore wing crenulate.

Family LASIOCAMPIDAE.

PRORIFRONS GRANULA, new species.

Male.—Palpi vinaceous brown. Antennae, head, tegulae, thorax, and base of abdomen vinaceous buff; abdomen otherwise above and hind wing fawn color; body below suffused with vinaceous brown, the tarsi deep mouse gray with whitish rings. Fore wing on basal area vinaceous buff, crossed by a wavy fawn color line its proximal side paler edged; medial space fawn color, 10 mm. wide on costa, 3 mm. wide on inner margin, proximally slightly outangled on costa and wavily vertical to inner margin, distally incurved from vein 5 to inner margin; a white point in cell followed by a dusky shade to postmedial line; postmedial space ochraceous buff darker before terminal area, crossed by a line, minutely lunular from costa to vein 4, defined by fawn color shading proximally; terminal area broadly fawn color its proximal side very irregular with black points at submedian. Hind wing with medial and postmedial darker lines. Wings below fawn color thickly irrorated with light buff and crossed by two buff lines, much broader on hind wings.

Expanse.—85 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 26216, U.S.N.M.

This species shows considerable variation, the coloring more uniform, the medial space narrower, the subterminal black points more numerous extending to near costa. The wings are broad as in *P. conradti* Druce, but not so variegated; the outer edge of medial space is not so oblique as in *P. prosper* Dyar from Mexico to which it is more closely allied.

PRORIFRONS HEMPSTEADI, new species.

Male.—Palpi vinaceous brown. Antennae, head, tegulae, and thorax light ochraceous buff. Abdomen fawn color shaded with buff laterally; throat, fore coxae, and tibiae vinaceous brown; tarsi vinaceous brown irrorated with white and with faint whitish rings. Fore wing: base to medial space light pinkish cinnamon irrorated with vinaceous fawn; antemedial line fawn color sinuously curved, proximally edged with whitish buff; medial space fawn color irrorated with whitish buff except on edges, 5 mm. wide on costal and inner margins, narrower between veins 5 and 1; a white point in cell; postmedial space buff white with fawn shading beyond cell, the postmedial line indicated by faint vinaceous gray edging followed by a broad light ochraceous buff shade, its outer edge very irregular with some small black spots; terminal space broadly fawn thickly irrorated with buff. Hind wing fawn color the termen irrorated with white; cilia cinnamon tipped with white. Wings below fawn color thickly irrorated with white; medial and postmedial whitish lines across both wings.

Expanse.—80 mm.

Habitat.—Chejel, Guatemala.

Type.—Cat. No. 26217, U.S.N.M.

Named after Don Roberto Hempsted at whose hospitable house innumerable specimens were collected.

TOLYPE ABDAN, new species.

Male.—Palpi and side of frons black, front and top of palpi narrowly white; frons white. Collar, thorax, and abdomen white. Fore wing white, thinly scaled; antemedial and postmedial brownish quadrate spots on costa; faint traces of subbasal and antemedial lines; an outcurved, postmedial series of short dark streaks on veins; a subterminal cinnamon buff line, inbent on costa, outset at vein 9 and rather broad to vein 6, narrower between veins 6 and 4, slightly broader again between 4 and 3, narrow again between 3 and 2; a streak of longer white scales on discocellular; termen narrowly more thickly scaled; three fuscous points at apex; cilia white. Hind wing smoky black; a whitish shade in disc; a narrow subterminal white shade; cilia tipped with white. Fore wing below white with traces of markings. Hind wing below white with long smoky streaks on interspaces postmedially.

Expanse.—30 mm.

Habitat.—Panama.

Type.—Cat. No. 26218, U.S.N.M.

Received from C. L. Pollard.

The cell of the hind wing is remarkably short, so that vein 6 arises from 7 close to base, 8 apparently from 9.

TOLYTIA, new genus.

Male.—Palpi: first joint with long fringe, porrect; second joint upturned with thick fringe; third joint porrect, short, resting on fringe of second joint. Antennae short, pectinated to tips. Abdomen with broad dorsal tufts. Tibiae and tarsi with long tufts. Fore wing broad, the outer margin rounded; vein 2 from near base of cell; 3 well before angle; 4 and 5 from lower angle; 6 and 7 on short stalk from upper angle; 8 from upper angle; 9 absent; 10 and 11 from cell. Hind wing: costa slightly rounded at base; termen and anal angle rounded; vein 2 from beyond middle of cell; 3 before lower angle; 4 and 5 from lower angle; 6 from 7 before end of cell; 8 and 9 from near base.

Type of genus.—*Tolytia multilinea* (*Tolyte*) Schaus.

Tolyte sanguilenta Dognin also belongs here.

TYTOCHA, new genus.

Male.—Palpi upturned to frons, clothed with long hairs which conceal the third joint. Antenna with long pectinations on basal half, shorter on terminal half. Abdomen with dorsal tuft at base. Legs clothed with long tufts except on terminal half of hind tarsi. Fore wing moderately broad, the termen oblique and crenulate; vein 2 from near base of cell; 3 from just beyond middle of cell; 4 and 5 from lower angle; 6 and 7 stalked from upper angle; 8 absent; 9 and 10 on long stalk from end of cell; 11 free approximating 12. Hind wing: costa produced at base, then excurved, the termen rounded and slightly crenulate; vein 2 from before angle; 3, 4, 5 from lower angle; cell half the length of wing; 6 from 7 before upper angle; 8 and 9 from near base.

Type of genus.—*Tytocha temperata* Schaus.

Tolyte crassilinea Dognin also belongs here.

TYTOCHA TEMPERATA, new species.

Male.—Palpi and frons whitish, the former with cinnamon buff shading behind. Body pale pinkish buff with faint transverse vinaceous buff lines on collar and abdomen dorsally. Legs vinaceous buff mottled with white. Fore wing pale pinkish buff crossed by sinuous vinaceous buff lines; a subbasal spot below cell; three antemedial lines; a fuscous line on discocellular with smoky shading on either side; three postmedial lines followed by a fourth broken line, and a broader subterminal similar shade; terminal cinnamon buff lines on interspaces and base of cilia. Hind wing pale pinkish buff, the veins whitish buff; a fine buff streak on discocellular. Wings below whitish, the lines on fore wing less distinct.

Expanse.—33 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 26219, U.S.N.M.

TITYA AVITA, new species.

Male.—Palpi, head, and body black; shoulders, side of collar, outer half of patagia, and a transverse line dorsally at base of abdomen pale flesh color; abdomen at end below and laterally salmon buff; thorax below and underside of legs whitish. Wings hyaline smoky gray with minute black irrorations. Fore wing more heavily scaled on base and along inner margin; veins partly very finely white; some white hairs at base; antemedial line white, fine, double, vertical to vein 2, angled and inbent; a black line on discocellular; postmedial line white, fine, double, outcurved below costa and again at vein 4, inangled on vein 2 almost reaching antemedial and connected with it by a white line on vein 2; a very fine and faint subterminal sinuous whitish line; a fine dark gray terminal line preceded by a few white scales; cilia short, white. Hind wing with the inner half clothed with smoky black hairs. Underside of wing showing faintly the markings of upper side.

The female has similar markings, but the wings are more opaque.

Expanse.—Male, 36 mm.; female, 59 mm.

Habitat.—São Paulo, Southeast Brazil.

Type.—Cat. No. 26220, U.S.N.M.

The species is allied to *T. proxima* Burmeister and *T. vitreus* Dognin.

TITYA ANGALA, new species.

Male.—Palpi black mottled above with some grayish hairs. Body above black; a faint whitish line across front of collar; outer side of collar, shoulders, and outer half of patagia pale ochraceous salmon; some white hairs terminally on abdomen above; lateral tufts of abdomen, sides of thorax below, underside of legs, and anal opening buff white. Fore wing pale ochraceous salmon, largely obliterated by the fuscous black markings as follows: a spot at base; a double antemedial line, outangled on vein 2, the inner portion much broader below cell; a large medial space from costa to vein 3, its inner edge curved, its outer edge incurved between veins 6 and 4, containing a small black pale edged spot on discocellular; an elongated spot medially on inner margin; a very wavy postmedial line somewhat interrupted towards inner margin, followed from costa by a broad space to vein 6, its outer edge lunular, below vein 6 parallel with and close to postmedial; an interrupted slight subterminal shade; terminal elongated spots on interspaces. The veins mostly ochraceous buff; cilia short, white. Hind wing smoky black; termen

narrowly pale ochraceous salmon with black points on interspaces. Fore wing below mostly black with subterminal white spots on interspaces. Hind wing below black; a whitish streak from base of cell and on interspaces between veins 2 and 5.

Expanse.—35 mm.

Habitat.—Rurrenabaque, Bolivia.

Type.—Cat. No. 26221, U.S.N.M.

Collected by Dr. William Mann.

The species is closely allied to *T. taruda* Schaus.

TITYA ARPIANA, new species.

Male.—Palpi fuscous with white tips to fringe in front, the third joint almost entirely white. Head and body whitish buff; some avellaneous mottling on frons and a fuscous lateral spot adjoining palpi; avellaneous lines on collar, similar bands on thorax and abdomen above. Fore wing whitish buff, the markings avellaneous; a basal line; a subbasal spot below cell followed by three broken and irregular lines; a darker spot at end of cell and a broken line below it to inner margin; terminal half crossed by four lines, outbent from costa, angled or outcurved at vein 7; a fifth line close to termen, macular from vein 4 to tornus; terminal spots on interspaces. Hind wing thinly scaled, white suffused with avellaneous on inner half; a streak on discocellular; a subterminal line and terminal spots extending on cilia on both wings. Wings below opalescent white, the lines faintly indicated.

Expanse.—36 mm.

Habitat.—Rio de Janeiro, Brazil.

Type.—Cat. No. 26222, U.S.N.M.

Closely allied to *T. septemlinea* Schaus.

TITYA EVERILDIS, new species.

Female.—Head and thorax fuscous. Abdomen natal brown, the two last segments fuscous. Fore wing ecru drab; veins on postmedial and subterminal space streaked with fuscous; base of wing smoky black; a smoky black spot below cell at vein 4, inbent, ending in a point at vein 2; a postmedial smoky black shade, broad on costa, its edges lunular from vein 5 to inner margin and from vein 6 divided by a faint ecru drab line; a similar subterminal line, its outer edge crenulate; cilia smoky black. Hind wing smoky drab gray, the veins buffy brown; a fine dark subterminal line; cilia fuscous.

Expanse.—44 mm.

Habitat.—Castro, Parana.

Type.—Cat. No. 26223, U.S.N.M.

The male is probably quite different; it is allied to *T. cinerascens* Walker of which the male is also unknown.

TITYA GUTHAGON, new species.

Female.—Head and thorax snuff brown. Abdomen wood brown, the two last segments snuff brown mottled with whitish hairs. Wings thinly scaled, avellaneous. Fore wing: some fuscous hairs at base above submedian; a white antemedial line, almost vertical, curved between cell and submedian; median vein on medial space tinged with fuscous expanding into a small spot at discocellular; a white postmedial line downcurved to vein 7, outangled and incurved, outcurved slightly below vein 4; some darker scaling after line on vein 7, beyond it a fine double dark line approximating postmedial from vein 5 to inner margin; a faint whitish buff subterminal line, wavy, lunular; a terminal whitish line, extending on to cilia at veins, so the termen appears crenulate; cilia on interspaces wood brown. Hind wing avellaneous; cilia with whitish spots at veins; a very faint medial whitish shade more distinct on underside.

Expanse.—50 mm.

Habitat.—St. Jean, Maroni River, French Guiana.

Type.—Cat. No. 26224, U.S.N.M.

Belongs to the group of *T. rivulosa* Butler.

TITYA VIUDA, new species.

Female.—Head, thorax, and abdomen above avellaneous suffused with drab, rather paler underneath. Fore wing whitish thickly irrorated with avellaneous and drab; two black points on discocellular; a very faint light cinnamon drab postmedial line, outcurved and wavy, closely followed by a fine smoky black parallel line outwardly followed on costa by a smoky black shade to the subterminal line, the latter drab, suffusing between veins 6 and 4 with the similar terminal line; two small cinnamon drab spots, outwardly edged with black and placed obliquely between veins 2 and 4, the upper spot below discocellular; cilia cinnamon drab. Hind wing buff white irrorated with light drab except on costa; cilia light buff. Fore wing below buff white irrorated with light drab except on inner margin; lines of upper side faintly indicated; cilia light buff tipped with light drab. Hind wing below as on upper side.

Expanse.—34 mm.

Habitat.—Formosa, Argentina.

Type.—Cat. No. 26225, U.S.N.M.

Allied to *T. nana* Druce group.

ARTACE ARGENTINA, new species.

Male.—Palpi black, the third joint mottled with white hairs. Head and body white, the thorax suffused with pallid mouse gray, the abdomen dorsally with mouse gray bands. Legs white, the fore

tibiae with deep neutral gray spots, the tarsi with broken black streaks. Fore wing opalescent white suffused with pallid quaker drab; a basal black point; subbasal points on costa and base of vein 2; double antemedial points superposed on costa, a single point on base of vein 3, and one below it on vein 2; two points on discocellular; a medial series of points on veins; also a postmedial series; a subterminal series of small smoky spots on interspaces; a fine terminal black line adjoining black spots on interspaces. Hind wing white; a very fine terminal black line; a smoky shade from vein 2 near termen to anal angle.

Expanse.—Male, 27 mm; female, 45 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 26226, U.S.N.M.

The black palpi and absence of terminal streaks on veins distinguish this species from allied forms.

ARTACE MENUVE, new species.

Male.—Palpi black. Body white dorsally suffused with drab gray. Legs white; fore tibiae with only a few black hairs, mid tibiae black above. Fore wing white, the cell and interspaces thinly scaled, slightly opalescent; the black points as in *A. argentina* Schaus; black streaks on veins terminally; no terminal black line, only the spots on interspaces. Hind wing white, the inner margin clothed with pale drab gray hairs.

Expanse.—29 mm.

Habitat.—Sao Paulo, South East Brazil.

Type.—Cat. No. 26227, U.S.N.M.

ARTACE SISOES, new species.

Male.—Palpi fuscous black above, white in front. Body white, the collar, thorax, and abdomen dorsally suffused with drab gray. Legs white, the fore tibiae with some black hairs, the fore tarsi with black rings and white and black tufts; mid tarsi black. Fore wing white, the cell and interspaces thinly scaled and opalescent; the series of black points as in *A. argentina* and *A. menuve*, but the postmedial row forming short streaks on veins; a subterminal smoky line cut by veins; some black irrorations on veins terminally; terminal black spots on interspaces. Hind wing opalescent white, the veins white; inner margin broadly covered with white hairs; an interrupted terminal black line; a smoky black subterminal line, only distinct at anal angle.

Female.—Fore wing pale smoke gray, the points on veins smoky drab, the antemedial and medial points connected by a fine line; sub-

terminal spots on interspaces, followed by a marginal smoky drab gray line. Hind wing drab gray; a subterminal broad white line.

Expanse.—Male, 30 mm.; female, 52 mm.

Habitat.—Cayuga, Guatemala; also from Quirigua, Guatemala.

Type.—Cat. No. 26228, U.S.N.M.

ARTACE HELIER, new species.

Male.—Palpi fuscous, the third joint crimson. Frons white mottled with fuscous hairs, its sides fuscous. Collar, thorax, and abdomen white mottled thickly with mouse gray hairs, the abdomen showing dorsally fine dark transverse lines. Legs clothed with white hairs, the fore coxae shaded with fuscous. Fore wing pallid neutral gray, the lines pale neutral gray, the costa and veins white, lines obliquely inbent from costa, basal, subbasal, and antemedial lines slightly curved on costa then nearly straight; medial line, beyond cell, lunular; postmedial lines less distinct, sinuous, all these lines marked with short streaks on veins; a subterminal macular shade, curved and broader at costa; terminal neutral gray spots on interspaces extending on the white cilia. Hind wing white, the inner margin clothed with drab gray hairs; a fine terminal line and base of cilia pale neutral gray. Fore wing below almost entirely drab gray; a postmedial white spot on costa and traces of whitish lines beyond. Fore wing below white, a faint subterminal macular pale neutral gray line and similar spots on base of cilia.

Female.—Hind wing thinly scaled white suffused with pallid neutral gray; a darker subterminal shade and line on base of cilia.

Expanse.—Male, 24 mm.; female, 32 mm.

Habitat.—Castro, Parana.

Type.—Cat. No. 26229, U.S.N.M.

Belongs to the group of *A. albicans* Walker and *A. rubripalpis* Felder. Nearer the former species.

EUGLYPHIS PLANITA, new species.

Male.—Head and thorax mottled sulphur white and black. Abdomen above mottled drab and grayish, underneath fawn color. Fore wing dark olive buff irrorated with black; lines fine, sorghum brown, followed by some white scaling on costa; antemedial out-curved hardly perceptible; post-medial faint, outbent on costa, dentate and inbent below vein 9; an oblique brown subapical line from costa, also followed by some white scales; cilia fuscous tipped with white. Hind wing sorghum brown, the costa broadly, the termen narrowly irrorated thickly with white scales with fine dark subterminal and terminal line at apex; cilia fuscous, partly light buff at base and tipped with white. Wings below cinnamon drab, the veins and

termen suffused with light ochraceous buff; cilia fuscous black tipped with white.

Expanse.—24 mm.

Habitat.—Villarica, Paraguay.

Type.—Cat. No. 26230, U.S.N.M.

Near *E. plana* Walker, but without the oblique terminal lines.

EUGLYPHIS SENUICIS, new species.

Male.—Head, thorax, and abdomen above mottled dark olive brown and white, abdomen laterally vinaceous russet, underneath light buff. Fore wing mostly dark olive buff suffused with buffy brown; ante-medial black and olive brown scaling in cell mottled with whitish scales which extend over medial area; some tawny hairs at base of inner margin; veins from cell streaked with black expanding into small spots on termen; a dark point at end of cell; postmedial line fuscous outbent on costa where it is followed by a parallel line, below vein 8 minutely lunular with white points on veins, vertical to inner margin; subterminal line fuscous outbent on costa, incurved between veins 6 and 4, indentate between 4 and 3, then wavy to tornus; cilia drab with whitish spots at veins. Hind wing pale ochraceous buff, the inner margin with tawny hairs; costal margin like fore wing; veins terminally streaked with fuscous brown; a subterminal wavy dark line from costa to vein 5. Wings below mostly light buff; cilia fuscous brown becoming paler at anal angle of hind wing; lines faintly indicated on costa, the subterminal line of fore wing very fine and evenly curved. Fore wing with veins 6 and 7 on short stalk, 8 from angle of cell.

Expanse.—27 mm.

Habitat.—Villarica, Paraguay.

Type.—Cat. No. 26231, U.S.N.M.

EUGLYPHIS MAHA, new species.

Male.—Head, collar, thorax, and legs deep brownish drab finely irrorated with white. Abdomen brownish drab. Fore wing: basal space to near middle deep brownish drab outwardly mottled with whitish scales, limited by a fine black line, vertical, slightly incurved below vein 2 to just above vein 1, followed throughout by a narrow white fascia which touches a black point on discocellular; outer half brownish drab minutely irrorated with white; a faint fine postmedial darker line, outcurved below costa, sinuous below vein 6 and defined by whitish points on veins; a faint fine and sinuous darker subterminal line; cilia dark brown with light buff spots. Hind wing brownish drab, the costa, apex, and termen to vein 2 irrorated with white; an inbent blackish brown line from apex to cell; termen at apex crenulate. Wings below wood brown

with darker postmedial and subterminal lines, the latter broader, macular.

Expanse.—30 mm.

Habitat.—Rio de Janeiro, Brazil.

Type.—Cat. No. 18537, U.S.N.M.

Closely allied to *E. temblora* Schaus which is smaller and has the line on hind wing medial and vertical.

Received from J. Arp.

EUGLYPHIS SERAPION, new species.

Male.—Palpi kaiser brown fringed with drab gray. Head and thorax mottled kaiser brown and pale drab gray. Abdomen cinnamon drab. Fore wing olive buff thickly irrorated with fuscous and brown to beyond middle; base of inner margin vinaceous fawn. Antemedial indicated by small clusters of white scales on costa and below cell; a small black spot at end of cell; postmedial indicated by short white streaks on veins; subterminal line fuscous, oblique on costa, then macular, parallel with termen, incurved below vein 3, veins beyond cell finely liver brown irrorated with white; cilia buffy brown with olive buff spots at veins and partly tipped with white. Hind wing cinnamon drab, the costal area to median and vein 5 as on forewing crossed by three postmedial white points; subterminal darker and only faintly indicated; terminal half of costa crenulate as well as termen. Wings below wood brown, the veins pinkish buff; cilia darker shaded in cross light.

Expanse.—31 mm.

Habitat.—El Sitio, Costa Rica.

Type.—Cat. No. 26232, U.S.N.M.

Can be placed near *E. charax* Druce.

EUGLYPHIS VISTORICA, new species.

Male.—Palpi, head, and body wood brown, a kaiser brown line on palpi behind. Fore wing wood brown thickly mottled with whitish scales, and on basal area with liver brown, the scales on medial area upturned; inner margin narrowly and veins warm buff irrorated with liver brown; antemedial line, faintly indicated, whitish; postmedial line fine, whitish, outbent on costa, sinuous; subterminal consisting of whitish lunules on interspaces with dark spots on proximal side; a fine light buff line on cilia at base and some whitish tips to cilia, also indistinct spots at veins. Hind wing above sayal brown, the costal area broadly like fore wing; a wavy white postmedial line, faint below vein 6; a wavy white subterminal line, macular towards costa. Wings below wood brown, palest on inner margin of fore wing, and costa of hind wing; veins pinkish buff;

a postmedial line, and macular darker subterminal line, both paler edged distally.

Expanse.—39 mm.

Habitat.—Las Quiguas, San Esteban Valley, Venezuela.

Type.—Cat. No. 26233, U.S.N.M.

Closely allied to *Claphe fusconigra* Dognin, but larger, the postmedial line of underside absent in Dognin's species.

EUGLYPHIS AUDIFAX, new species.

Male.—Palpi light buff with a lateral chestnut brown spot at base. Head, tegulae, and thorax pale drab gray, the tegulae slightly mottled with brown hairs; a chestnut brown spot on metathorax. Abdomen light drab. Legs with drab gray hairs, the fore tibiae more whitish. Fore wing whitish, the base thickly mottled with chestnut brown hairs, mostly upturned, limited by a fine line inangled below cell; a fuscous black spot at end of cell, the space beyond to postmedial line suffused from vein 3 to costa with light drab; postmedial line fine, double, outangled below costa, slightly incurved and outangled below vein 4, then inbent to inner margin, consisting of brownish scales, followed on costa by a small quadrate chestnut brown spot and a similar double spot between veins 4 and 6, the latter forming part of a smaller series of subterminal spots; termen shaded with light cinnamon drab except at apex and tornus; cilia hair brown with white spots at veins. Hind wing cinnamon drab, the apical half of costa, apex, and termen white; a subterminal outangled line from costa, inangled below vein 6; cilia as on fore wing. Wings below drab, the veins light buff; termen whitish buff; subterminal smoky brown spots; a fine postmedial line on hind wings.

Expanse.—32 mm.

Habitat.—Callao, Peru.

Type.—Cat. No. 26234, U.S.N.M.

Collected by Mrs. M. J. Pusey.

Allied to *E. ogenes* Herrich Schaeffer, *E. bochica* Schaus, and *E. murina* Möschler.

EUGLYPHIS SCHADEL, new species.

Female.—Head and thorax mottled brownish olive and light mouse gray, the latter color predominating. Abdomen drab. Fore wing light mouse gray irrorated finely with brownish olive, the basal third with black irrorations, the markings smoky black; a faint outcurved subbasal line; antemedial wavy, vertical, inbent below vein 2; postmedial near cell, outcurved on costa, wavyly lunular to just beyond middle of inner margin; subterminal line macular from an outbent line on costa, incurved at vein 5, the spots from vein 5 to tornus

partly dentate, above vein 5 small, round. Hind wing similar, the inner margin broadly covered with drab hairs; a black medial line from costa to lower angle of cell; a fine irregular subterminal line, lunular from vein 3 to anal angle; cilia on both wings brownish. Wings below light drab, the apices irrorated with white; traces of subterminal and medial lines; a brownish terminal line; cilia at base buff gray.

Expanse.—54 mm.

Habitat.—Villarica, Paraguay.

Type.—Cat. No. 26235, U.S.N.M.

Can be placed near *E. herberti* Schaus.

EUGLYPHIS GUNDLEA, new species.

Female.—Palpi wood brown, the hairs in front tipped with fuscous. Head and collar vinaceous fawn mottled with gray. Thorax wood brown mottled with white. Abdomen wood brown with faint fuscous transverse lines. Fore wing drab gray; basal area to near middle of costa, and one third of inner margin vinaceous brown, crossed by a darker subbasal curved line and a double curved antemedial line incurved above vein 1, the outer line limiting the basal area; a double vinaceous brown postmedial line, outbent on costa then sinuous, somewhat lunular; a dark gray subterminal line, partly shaded with white. Hind wing benzo brown, the apical area drab gray.

Expanse.—32 mm.

Habitat.—Rurrenabaque, Bolivia.

Type.—Cat. No. 26236, U.S.N.M.

EUGLYPHIS VANDRILLA, new species.

Female.—Head, thorax, and hairs on legs brownish drab, the hairs terminally pale mouse gray. Abdomen and hind wing drab. Fore wing brownish drab thickly irrorated with pale mouse gray except on lines, the antemedial thick, wavyly curved, followed by a more irregular finer line, the postmedial almost vertical, faintly incurved on costa, preceded by a finer line; a dark point at end of cell; a wavy subterminal row of small brownish drab spots; cilia brownish drab. Hind wing with some pale mouse gray irrorations at apex and on termen to vein 2. Wings below drab, the veins faintly ochraceous buff.

Expanse.—28 mm.

Habitat.—Villarica, Paraguay.

Type.—Cat. No. 26239, U.S.N.M.

EUGLYPHIS ALDEGONDES, new species.

Male.—Head, collar, and thorax mottled vinaceous rufous and light buff. Abdomen above cinnamon rufous, underneath pinkish

buff. Fore wing cinnamon rufous, at end of cell and before subterminal line tinged with light vinaceous fawn; costa mottled like thorax on basal half, then mottled with gray to apex; traces of antemedial and medial lines, more ferruginous in color, the medial with black points on veins; postmedial line oblique on costa, consisting of short black and white streaks on veins, from vein 6 to 4 forming a straight black line, below vein 4 slightly wavy to inner margin, outwardly paler edged and followed by a parallel ferruginous line; subterminal line thick, black, very pronounced, outbent on costa, incurved below vein 6, outcurved to vein 3, then downturned to inner margin; a terminal ferruginous line and similar streaks on veins. Hind wing mostly cinnamon rufous, only the costa, apex, and termen to vein 3 with grayish white mottling; subterminal line thick, black, wavy. Wings below almost entirely vinaceous rufous, the fore wing shaded with black beyond cell, the subterminal line finer, less distinct, the hind wing with traces of subterminal line and some black shading at anal angle.

Expanse.—30 mm.

Habitat.—Rurrenabaque, Bolivia.

Type.—Cat. No. 26240, U.S.N.M.

Collected by Dr. William Mann.

Termen of fore wing roundly oblique; costa of hind wing rounded at base, the anal angle somewhat prolonged.

EUGLYPHIS CASIMIR, new species.

Female.—Palpi and head orange cinnamon. Thorax and abdomen sayal brown. Fore wing rood's brown suffused with benzo brown, the inner margin suffused with orange cinnamon; two black points at end of cell; a double subterminal white line, parallel with termen, the outer line lunular. Hind wing rood's brown; a few white hairs on termen and cilia at apex. Wings below rood's brown without markings.

Expanse.—30 mm.

Habitat.—St. Jean, Maroni River, French Guiana.

Type.—Cat. No. 26241, U.S.N.M.

Can be placed near *E. guttularis* Walker.

EUGLYPHIS SURAMIS, new species.

Male.—Palpi ferruginous. Head black with ferruginous lines at sides of frons. Collar and thorax fuscous black, the shoulders mottled with hazel hairs. Abdomen hazel overlaid at base and laterally with fuscous black hairs. Legs mikado brown, the fore legs mottled with whitish hairs. Fore wing narrow, apex acute, termen very oblique, the basal space kaiser brown, the veins black with white

irrorations; basal, subbasal and antemedial liver brown spots forming curved lines; a medial chestnut brown line, curved below cell, dentate outwardly at veins and emitting in cell a line to discocellular; space beyond to the rather remote postmedial, liver brown, mottled between veins 5 and 6 and on inner margin with apricot buff; postmedial line very indistinct, lunular, kaiser brown, defined by some apricot buff scales from vein 5 to vein 2; apical third of costa kaiser brown, a fuscous shade below it, a subterminal fuscous brown irregular shade; termen apricot buff irrorated with kaiser brown; cilia kaiser brown with faint light buff points at veins. Hind wing greatly produced on inner margin and anal angle, the outer margin slightly incurved, seal brown; a broad postmedial line from costa to vein 4, apricot buff irrorated and divided by a kaiser brown line; edge of termen and base of cilia apricot buff irrorated with kaiser brown, and with some small white spots on tips. Wings below uniform chestnut brown.

Expanse.—30 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 26242, U.S.N.M.

Can be placed near *E. cacopasa* Dyar and *E. aldegondes* Schaus, the hind wing more produced than in those species.

Family CERURIDAE.

ELYMIOTIS PLECHELM, new species.

Male.—Palpi light buff above, natal brown below. Head buffy brown mottled with natal brown. Collar mostly citrine drab, the scales behind partly tipped with black. Thorax buffy brown. Abdomen above benzo brown, the dorsal tuft at base army brown, underneath whitish buff irrorated with dark olive gray; a black ventral line; fore coxae and throat bone brown. Fore wing cinnamon drab; the median vein, a basal space below cell, the interspaces near cell between veins 2 and 4, and a streak on costa whitish buff, the latter irrorated with black and crossed by numerous dark lines; a short fuscous streak from base of costa obliquely to subcostal; fine, geminate subbasal and antemedial lines above and below cell; a dark brown streak through cell interrupted by short medial lines, beyond cell fine, fuscous black to near termen; a velvety black point at lower angle of cell, and a smaller point above it; another point in cell below subcostal; medial line double with tuft of raised scales below cell, a dark shade from it to submedian at antemedial line; space beyond cell between veins 4 and 6, also termen suffused with purplish brown; postmedial line dark brown, double, consisting chiefly of small lunules across veins; a subapical curved whitish line irrorated with orange cinnamon between veins 7 and 8; fine black sub-

terminal lunules on interspaces; veins terminally fuscous; a fine wavy terminal line. Hind wing white, the outer half and costa bronzy cinnamon drab; cilia white. Hind wing below with the white more extended, reaching anal angle.

Expanse.—40 mm.

Habitat.—Peru.

Type.—Cat. No. 26357, U.S.N.M.

Can be placed near *E. audax* Druce.

ANTIOPHA PITTIERI, new species.

Male.—Palpi bone white above, the base of third joint fuscous, the fringe below fuscous with a few white hairs. Head, collar, and thorax white mottled with fuscous. Abdomen above bone white with drab gray segmental lines. Body below and legs whitish; fore and mid femora fuscous irrorated with white, the fore and mid tarsi fuscous with white rings. Fore wing whitish thickly irrorated with drab and grayish olive; base of costal margin fuscous, also a spot below cell limited by a subbasal irregular white line, followed by a fuscous patch on costa reaching median vein; a white antemedial line outangled below cell, partly shaded with cream white and edged with some fuscous scales, forming a thick line distally from fold to just below vein 1; a large dark olive patch from within lower part of cell, edged with fuscous black scales, its proximal side oblique to vein 2, above sinuous with a clear white line above it, followed from vein 4 by a broad fuscous fascia to costa near apex, with clearer white before it and distally edged with white, from below vein 4 a fine dark olive, irregular line, extends from the outer edge of the fascia to inner margin; termen from vein 3 to apex suffused with dark grayish olive; a fine subterminal and a terminal interrupted black line with white points on veins; cilia dark olive. Hind wing white, thickly suffused with drab, the cilia white. Hind wing below white with a fine terminal fuscous line not reaching anal angle.

Expanse.—27 mm.

Habitat.—Valera, Venezuela.

Type.—Cat. No. 26358, U.S.N.M.

Collected by H. Pittier.

Very similar to *A. marcella* Schaus, smaller, brighter, and with white cilia on hind wing.

DICENTRIA MANNI, new species.

Male.—Palpi cinnamon buff with a lateral black streak behind; head russet with some black hairs on vertex; thorax fuscous, the patagia, lateral tufts, and tegulae cinnamon buff mottled with drab and gray, the front of tegulae dark russet. Abdomen above fuscous,

the base and anal hairs light cinnamon drab; a black dorsal tuft at base; underneath pale pinkish buff with a fine dark ventral line. Fore wing: base to antemedial line mostly fuscous with some cinnamon buff scaling along fold and inner margin, the space between silvery gray with darker irrorations; antemedial line black, outbent on costa, inangled to near base below subcostal; medial line outbent on costa, then nearly vertical to below cell where it bifurcates, the inner branch wavy and incurved on submedian, the outer branch wavy and outcurved on submedian, both vertical and parallel below submedian; some whitish scaling in end of cell; a velvety black brown line on discocellular followed by a broad fuscous shade from vein 6 to vein 2; postmedial line double, fine, black, outbent and close together on costa, then rather widely apart, the inner line suffusing with the fuscous shade beyond cell, the outer line deeply dentate, the space between partly light quaker drab, the angles on outer side filled in with light ochraceous buff; costa from above discocellular to apex pale grayish; terminal area mostly russet, the veins mottled quaker drab and whitish; fine black lines on interspaces, faintly bifurcating before termen enclosing small terminal black points; a velvety brown black streak subterminally at vein 8; a small subterminal quadrate white spot between veins 2 and 3; the postmedial area above inner margin whitish; cilia white on interspaces. Hind wing whitish with hair brown scaling, the margins broadly suffused with hair brown. Fore wing below fuscous with faint whitish spots on termen. Hind wing below whitish.

Expanse.—34 mm.

Habitat.—Rurrenabaque, Bolivia.

Type.—Cat. No. 26067, U.S.N.M.

Collected by Dr. William M. Mann during the Mulford Biological Expedition.

RIFARGIA CINGA, new species.

Female.—Palpi cartridge buff streaked above with black. Head mottled light buff and white. Collar and thorax cinnamon; patagia gray white, the dorsal edge mottled with black and cinnamon. Abdomen whitish gray, with dark irrorations, overlaid except on two last segments with dull brownish and light cinnamon hairs, underneath whitish. Legs mostly clothed with buff white hairs, the tarsi dark brown with white rings. Fore wing mostly silvery white with grayish irrorations; a fine black line from base of costa, outbent and irregular to inner margin followed by a small black spot below cell; antemedial line black, double, oblique on costa, outset on subcostal and outcurved to vein 1 where it is slightly inangled, a short double line above it on costa; a broad oblique buffy brown shade from costa across antemedial line to postmedial from vein 3 to inner margin;

reniform finely outlined in black; postmedial line fine, black, double, almost straight to vein 3, incurved below vein 3, and again below vein 1; terminal space iridescent buffy brown with a very faint and irregular whitish shade; a fine subterminal black line, lunular from vein 4 to tornus, the points reaching termen. Hind wing dull buffy brown.

Expanse.—54 mm.

Habitat.—Rockstone, British Guiana.

Type.—Cat. No. 26359, U.S.N.M.

Close to *R. apella* Schaus; recognized easily by the straighter post-medial line.

HEMICERAS CADOCA, new species.

Male.—Palpi above, head, and collar tawny, palpi in front, a line on vertex and tufts at base of antennae white. Thorax and fore wing light ochraceous buff irrorated with grayish olive. Abdomen above tawny; body below and legs whitish, some tawny irrorations on venter; fore femora and the tarsi tawny. Fore wing: veins finely grayish olive, the two lines and cilia pecan brown, the medial side of veins edged with dark olive gray; first line from beyond middle of costa straight and inbent to a slight projection on inner margin before middle; second line from costa close to apex inbent to inner margin beyond middle, the lines further apart on costa than on inner margin; a narrow subterminal dark olive gray shade from vein 4 to vein 2; base of median more heavily dark shaded; an oblique pecan brown line from base below cell to vein 1 near first line. Hind wing white, the inner margin broadly, the termen narrowly tawny; stigma pecan brown. Wings below white, the costal margin and apical area of fore wing tawny.

Expanse.—40 mm.

Habitat.—Victoria, Espiritu Santo, Brazil.

Type.—Cat. No. 26360, U.S.N.M.

CHLIARA SVIDBERTI, new species.

Male.—Antennae bipectinate, the shaft whitish, the pectinations avellaneous. Head, collar, and thorax avellaneous, the palpi black in front, the head and collar with some fuscous hairs. Abdomen above and thorax underneath vinaceous fawn; abdomen below vinaceous buff. Fore wing vinaceous buff; basal third with apparently four very indistinct darker wavy, vertical lines; a fifth line more distinct and lunular forms the antemedial and is marked by black points on subcostal, in cell, and on submedian fold; black and white points along subcostal, median and submedian from base to antemedial line; medial space a trifle darker, broadest from costa to vein 4; black points along upper edge of cell and on discocellular

the latter with a small white spot above vein 4; black and white points beyond cell on veins 5 and 6 followed by a faint darker line and some more points on veins 5 to 7; postmedial line double, very faint, lunular, slightly darker than ground color, inbent from costa to vein 4, then incurved to inner margin; subterminal wavy; black and white lines on interspaces; some clusters of black scales on termen. Hind wing pinkish buff, the inner margin cinnamon buff.

Expanse.—43 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 26068, U.S.N.M.

Family LIPARIDAE.

PHIDITIA MINOR, new species.

Male.—Head cinnamon drab. Thorax benzo brown. Abdomen cinnamon drab dorsally suffused with benzo brown. Legs grayish cinnamon; fore femora with dark streaks; fore coxae and palpi hazel. Fore wing mostly benzo brown with light grayish olive irrorations on inner side of antemedial line, on costa, and between postmedial and subterminal lines; lines fuscous, the antemedial outcurved below costa, vertical below cell, the medial parallel with it, the postmedial lunular slightly outcurved below costa then vertical; a fuscous point on discocellular followed by a lunule from costa conjoined with medial line below it; costal edge tawny; a fuscous subterminal line outangled on vein 7, then incurved to termen at vein 3, followed by a tawny line between veins 6 and 7; cilia cinnamon drab tipped with white. Hind wing benzo brown, the outer half suffused with grayish; a dark medial and postmedial line. Wings below suffused with tawny; a fuscous medial shade; a postmedial fine fuscous line, outwardly edged with grayish, vertical and straight on fore wing, curved on hind wing.

Expanse.—29 mm.

Habitat.—Trinidad, Paraguay.

Type.—Cat. No. 26361, U.S.N.M.

Allied to *P. cuprea* Kaye.

Family MEGALOPYGIDAE.

PODALIA SCHADEI, new species.

Male.—Shaft of antennae white, the pectinations drab very finely streaked with white. Palpi fuscous black. Body whitish with drab markings as follows: lines on tegulae in front and behind, thorax medially, large spots on patagia, lateral streaks on metathorax, transverse lines on abdomen. Body below without markings; the tibiae

and tarsi fuscous black. Fore wing drab; base below costa white, extending as a line to middle of wing below subcostal, also a fine white line above subcostal vein; an angled white line at end of cell before a drab spot, suffusing beyond it with a white annulus containing a drab spot; a postmedial inbent lunular white line, the points of lunules slightly produced basad on veins; terminal space with fine white lines on veins, and thicker white streaks on interspaces, the latter diverging on termen and enclosing drab spots. Hind wing rather paler with drab hairs on inner area and terminal spots on interspaces.

Expanse.—47 mm.

Habitat.—Villa Rica, Paraguay.

Type.—Cat. No. 26069, U.S.N.M.

Received from Don Pedro Jorgensen.

Named after Mr. Schade of Villa Rica.

MEGALOPYGE BRAULIO, new species.

Male.—Antennae vinaceous buff, a streak on shaft and tips of pectinations white. Palpi ivory yellow shaded laterally at base with bister. Head and body bister; ivory yellow spots on vertex, shoulders, front of thorax and dorsally on first segment of abdomen, the following segments with white spots expanding gradually to anal segment; some whitish hairs on tegulae. Body below and legs bister. Fore wing drab; some white at base and a bister subbasal point; a white shade at end of cell enclosing a fuscous discal spot; a whitish postmedial shade from which white streaks extend on interspaces to near termen, the veins terminally finely streaked with white; basal half of costa with white streaks above and below costal vein. Hind wing whitish, the veins broadly drab. Wings underneath white, the veins drab, broadly so terminally on fore wing which also has the cell drab to near end.

The female has no white on termen of fore wing; a white wavy line on basal half of costa, and the usual crinkly hairs from base to beyond middle, the postmedial white hairs forming wavy lines. Hind wing thinly scaled, hair brown, the veins slightly darker.

Expanse.—Male, 30 mm.; female, 39 mm.

Habitat.—Villa Rica, Paraguay.

Type.—Cat. No. 26070, U.S.N.M.

Differs from *M. albicollis* Walker and *M. superba* Henry Edwards in the drab color of wings, and in the less intense white markings of postmedial area of fore wing.

Received from Don Pedro Jorgensen.

Family PYRALIDAE.

Subfamily PYRAUSTINAE.

PILOCROCIS NALOTALIS, new species.

Male.—Palpi greenish olive, the first joint mostly white, the second partly fringed with white; frons cupreous; vertex mottled deep brownish drab and naples yellow; collar deep brownish drab, with naples yellow spots outwardly; thorax naples yellow, the patagia mottled brownish drab and naples yellow; abdomen above deep chrome, with fine segmental fuscous black lines, the anterior line on second segment broader, a short thick line on pre-anal segment and a white line on same segment behind; anal segment with dorsal fuscous streak, and subdorsal ochraceous white lines; body below and legs silvery white, the fore and mid tibiae with dark streaks, the fore tarsi with fuscous spot near base and at joint with tibiae. Fore wing dark purple drab, the markings naples yellow; a basal line, a curved antemedial line, a small quadrate spot in cell containing a dark point, a small spot below cell, a postmedial fascia from vein 7 to vein 2, its outer edge expanding between veins 5 and 3, some spots beyond from costa to vein 6, and smaller spots from veins 5 to 2; cilia mostly neutral gray, with a fine pale line at base. Hind wing naples yellow, the lines and termen broadly cupreous dark purple drab; antemedial line straight, rather broad, not reaching anal angle; postmedial line separated from termen by a sinuous naples yellow narrow fascia from costa to close below vein 2; cilia neutral gray with a pale line at base and white tips. Underside almost the same, but duller, the antemedial line of hind wing divided in cell by a pale line.

Expense.—30 mm.

Habitat.—Loja, Ecuador.

Type.—Cat. No. 26051, U.S.N.M.

A cotype in collection Dognin, to whom I am indebted for a specimen.

CONCHYLODES VINCENTALIS, new species.

Female.—Palpi, head, collar, and thorax white; black spots on vertex, tegulae, shoulders, thorax, and patagia. Abdomen above white on basal segments, with a broad black transverse line on second segment, and dorsal black points on next two segments, the others orange buff with segmental white lines. Legs white, the fore tibiae with a fuscous streak; tarsi with fine black rings. Fore wing white, the lines black; a subbasal line from costa to below cell; antemedial line oblique; a small medial annulus across cell; a large annulus around discocellular; postmedial inbent on costa, outcurved at vein 6 and downbent to near inner margin where it is retracted

to discocellular annulus, curved and downbent to inner margin; subterminal line straight parallel with terminal line, the two connected by a bar above vein 5; cilia white. Hind wing white; a black point on discocellular; a postmedial line from vein 6 to below vein 2, retracted to cell, sinuous to inner margin above angle, interrupted near cell and before inner margin; subterminal and terminal lines faint towards anal angle.

Expanse.—21 mm.

Habitat.—Buena Vista, Bolivia.

Type.—Cat. No. 26052, U.S.N.M.

Near *C. argentalis* Cramer.

DICHOCROCIS NIMALIS, new species.

Male.—Palpi white streaked with reddish brown above. Head silky white. Collar white shaded in front with buff. Thorax buff, the patagia outwardly white. Abdomen dorsally brown at base, with white spots, terminally gray with white segmental lines; underneath white. Legs white. Fore wing thinly scaled iridescent gray brown; base darker; two small spots antemedially in cell, and two streaks medially, with whitish shades around them; a darker streak on discocellular, somewhat divided by a whitish line; a subterminal broad white line from costa to vein 5; whitish shading terminally, and small brown spots on interspaces; cilia white mottled with pale brown. Hind wing semihyaline white, the costal margin and termen broadly grayish brown, crossed by a wavy subterminal white line; a terminal white line; cilia dark brown at base, then paler and tipped with white. Wings below grayish white showing indistinctly the markings of upper surface.

Expanse.—20 mm.

Habitat.—Bolivia.

Type.—Cat. No. 25596, U.S.N.M.

Belongs near *D. prosalis* Druce.

PILETOSOMA TACTICALIS, new species.

Male.—Palpi fuscous brown, the base below, throat, and fore femora silvery white. Head fuscous gray, the frons shot with blue. Thorax fuscous gray with vivid metallic blue markings. Abdomen above ochraceous gray tinged with metallic blue, underneath fuscous gray tinged with blue and with four segmental white lines. Legs fuscous. Fore wing iridescent purple, tinged with blue on basal half; the immediate base, costal and inner margin brilliant dark blue; cilia fuscous with paler tips. Hind wing iridescent purple, the base and inner margin tinged with blue; cilia black at base, broadly tipped with white. Wings below duller with bluish tinge only on inner margin of hind wing.

Expanse.—30 mm.

Habitat.—Tactic, Guatemala.

Type.—Cat. No. 25606, U.S.N.M.

The antennae are simple.

PILETOSOMA CHAQUIMAYALIS, new species.

Male.—Antennae simple, dark brown above, whitish below, also tips. Palpi fuscous, base below, throat, and fore femora light orange yellow. Body above purplish fuscous, underneath and legs whitish yellow. Wings rather thinly scaled in disk vandyke brown tinged with iridescent purple, the veins on fore wing and costal margin fuscous purple. Wings below paler.

Expanse.—32 mm.

Habitat.—Chaquimaya, Peru.

Type.—Cat. No. 25607, U.S.N.M.

PILETOSOMA GULANALIS, new species.

Male.—Palpi orange buff with a grayish streak above. Antennae with ridge of hairs along the third fourth, brown, the terminal fourth white. Frons fuscous gray with metallic blue scaling; vertex sayal brown. Collar and thorax dusky slate-violet. Abdomen above dusky slate-violet, underneath orange buff; thorax below orange buff, the legs whitish yellow, fore femora orange buff. Fore wing silky vandyke brown, the costa dark purplish; faint semihyaline markings at end of cell, below cell and beyond cell on interspaces, these markings are more pronounced in the female. Hind wing the same, but the semihyaline markings still less distinct, the termen narrowly tinged with black; anal angle slightly lobed with small fovea. Wings below lighter brown.

Expanse.—27 mm.

Habitat.—Rockstone, British Guiana; also from French Guiana.

Type.—Cat. No. 25608, U.S.N.M.

STYLEPTA MITANALIS, new species.

Female.—Palpi white, the end of second joint with a buff ring. Head white; frons with some drab shading. Collar gray brown tipped with white. Thorax dark purple in front, white behind; patagia silky gray, dorsally edged with cream color. Abdomen dorsally buff brown with medial dark brown spots; laterally with fuscous brown spots; none of the spots extend on to the last two segments. Legs and tarsi white. Fore wing silky brownish drab; costal margin white between the two lines; basal and subbasal interrupted white lines across costal margin and cell; a white basal spot on inner margin; a fine dark antemedial line defined by whitish shading on either side and with a more distinct small white spot inwardly be-

low cell, and similar spots on either side on inner margin; a small white shade near end of cell, and a white shade beyond cell between veins 5 and 7; a faint dark subterminal line, faintly lunular dentate; a darker terminal shade with small white spots on interspaces; cilia gray with a darker basal line. Hind wing semihyaline white shaded with drab, except at base; a darker postmedial line outwardly edged with white; termen with white lunules forming a line from vein 3 to anal angle; cilia white with dark spots at veins. Underneath duller the spots on fore wing showing through, the hind wing whitish with only a dark postmedial line.

Expanse.—30 mm.

Habitat.—Yahuarmayo, Peru.

Type.—Cat. No. 25594, U.S.N.M.

Close to *S. excelsalis* Schaus.

MARGARONIA CELESTINALIS, new species.

Male.—Fore wing with down-turned fringe at base of costa below concealing tufts of long hairs. Palpi orange brown fringed below with white. Head, collar, and thorax white; front of collar and a line on shoulders orange brown. Abdomen creamy white above, the anal hairs black. Body below and legs white, the fore tibiae and tarsi yellow brown. Fore wing above bright iridescent gray, the margins narrowly duller, the base white; a white streak below subcostal; costa yellow brown with a silver streak above subcostal; a terminal dark line broken into spots near apex. Hind wing less brilliantly iridescent, the base and inner margin more whitish; terminal line continuous. Wings below with the outer margins broadly dark shaded, the basal half of costa of hind wing white.

Expanse.—31 mm.

Habitat.—Yahuarmayo, Peru.

Type.—Cat. No. 25601, U.S.N.M.

MARGARONIA CULMINALIS, new species.

Male.—Body above clay color; base of palpi below and throat white; lateral black tufts on anal segment. Body below white, tibiae partly clay color. Fore wing above silky clay color; an oblique black shade from below cell antemedially to middle of inner margin; discocellular finely fuscous; subterminal semihyaline white spots edged with fuscous above and below vein 6, and a white point above vein 7; from vein 5 to inner margin a semihyaline white line outwardly edged with fuscous, the space before it more thinly scaled; cilia with basal darker points. Hind wing semihyaline white; a black point on discocellular; termen faintly whitish clay color, defined by faint subterminal and terminal fine darker lines. Wings

below similar, paler; hind wing with a black point also at upper angle of cell.

Expanse.—38 mm.

Habitat.—Loja, Ecuador.

Type.—Cat. No. 25602, U.S.N.M.

Paratype in collection Dognin.

MARGARONIA DELICATALIS, new species.

Male.—Head black. Tegulae fuscous with large white spots. Thorax fuscous brown, patagia white. Abdomen white with dorsal fuscous brown line. Legs white. Fore wing iridescent white, thinly scaled; costa and outer margin narrowly fuscous brown; a small triangular spot its base on costa above discocellular; a brown line from costa near apex almost suffusing with terminal line from vein 6 to tornus where it joins a fuscous brown line which extends from base along submedian vein, the inner margin remaining white. Hind wing iridescent semihyaline white; the outer margin narrowly fuscous brown; cilia on both wings fuscous tipped with white and with a buff line at base. Wings below similar.

Expanse.—23 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 25603, U.S.N.M.

Received from P. Dognin.

Belongs to the group of *M. heliconialis* Guenée.

MARGARONIA TOLIMALIS, new species.

Male.—Palpi fuscous with some white hairs below. Frons reddish brown with lateral white lines; vertex reddish brown; thorax fuscous, the patagia with dorsal edge broadly white. Abdomen fuscous with some fine segmental white lines, dorsally. Thorax below, throat, and fore femora silvery white; legs mostly fuscous. Fore wing fuscous brown; an oblique antemedial semihyaline iridescent white fascia from subcostal to submedian fold beyond middle of wing; a similar postmedial fascia from subcostal to vein 2, less oblique with its inner edge nearly straight, its outer edge rounded; a subterminal whitish line from vein 8 to inner margin near tornus. Hind wing semihyaline, iridescent white, the margins broadly fuscous brown. Wings below similar, the subterminal line of fore wing very indistinct.

Expanse.—29 mm.

Habitat.—Canon del Tolima, Colombia, at 1,700 meters.

Type.—Cat. No. 25604, U.S.N.M.

A paratype in collection Dognin has the markings somewhat broader.

Near *M. riolalis* Schaus.

MEGASTES OLIVALIS, new species.

Male.—Antennae with the shaft whitish buff, the pectinations black. Palpi inwardly white, outwardly drab. Head, collar, and thorax buff white shaded with pale drab gray according to light. Abdomen above drab with paler lines posteriorly on segments; basal segment cinnamon with a short transverse white line in front, its ends downbent; second segment with a white line in front expanding laterally into triangular spots, followed subdorsally by a small oval white spot; a sublateral wavy black band; ventral surface like dorsum but without white markings. Fore wing grayish olive; a white streak medially along costa; inner margin broadly white at base; a black basal line on costa, and a similar subbasal line from costa across cell; antemedial line black, outcurved to below cell, then slightly incurved; medial space whitish, with a large grayish olive spot in cell, an ovate spot below cell, and an irregular spot on inner margin; a quadrate dark spot at end of cell with black lines on either side; postmedial line black, remote, irregularly wavy to vein 2, then upbent and curved below end of cell and downbent to near middle of inner margin, followed by semihyaline white spots, larger between veins 8 and 6, then small to vein 2 and again larger from cell to inner margin; costa on terminal third light buff; cilia whitish buff with small dark spots at veins, also divided by a fine dark line. Hind wing semihyaline white; a small black spot on discocellular; a faint postmedial line from costa, outcurved below vein 5 to near termen and hardly traceable, reappearing as a small spot on submedian fold; termen narrowly black, reduced to small spots between veins 2 and 5; cilia cream color tipped with white. Fore wing below whitish, the costa and termen grayish olive; a black annulus in cell, and quadrate spot at end of cell; postmedial line less distinct, only the two hyaline spots between veins 8 and 6 apparent. Hind wing below with terminal markings fainter, the discal spot larger.

Expanse.—36 mm.

Habitat.—Trinidad, Paraguay.

Type.—Cat. No. 26053 U.S.N.M.

AZOCHIS ESSEQUEBALIS, new species.

Female.—Palpi black, basal half below white. Head, body, and legs white; a fine black edge to frons laterally and in front; subdorsal black spots at base of abdomen; two transverse black bands medially, with a dorsal spot on preceding segment, and a black spot on anal segment. Wings thinly scaled, iridescent white, the markings black. Fore wing: basal points on costa, in cell, and below submedian; subbasal patches on costa, in cell, and below submedian; a thick antemedial outcurved line; a medial streak

from costa entering cell, suffusing on subcostal with a thick line from costa across discocellular to veins 3 and 4; a thick inbent line from vein 5 to inner margin; a thick vertical line from costa to vein 5 beyond, with a finer line from its outer edge, outbent and gradually expanding to a large spot at tornus; a large marginal spot, broad below vein 6 and diminishing to near vein 3; marginal black points above and below vein 7; termen narrowly more thickly scaled. Hind wing: a fine streak on discocellular; medial clusters of scales at veins 5 to 3, before vein 2, and toward inner margin; a postmedial line from veins 7-5, then downbent to termen at vein 2; a marginal spot between veins 6 and 8, and another from below vein 6 to vein 4; the termen more thickly scaled; cilia on both wings creamy at base, with fuscous scaling at veins.

Expense.—28 mm.

Habitat.—Rockstone, British Guiana.

Type.—Cat. No. 25598, U.S.N.M.

POLYGRAMMODES DUBIALIS, new species.

Female.—Palpi reddish brown above, white below. Head white. Collar white tipped with hazel. Thorax hazel, crossed in front by a white shade. Abdomen above hazel; dorsal white points on basal segment, large spots on next two segments, then white stripes on following segments, interrupted by the hazel segmental lines; lateral white spots; underneath white. Legs white; fore tarsi banded with hazel. Fore wing white, the veins and markings hazel; the basal third, except a white line on inner margin, suffused with hazel; a white point at middle of cell, and a transverse white spot beyond it, crossed by a hazel crescent on its outer edge; traces of an antemedial line with a projecting line below cell; discocellular line heavy, suffusing with costa, below it a thick line from base of vein 2 to submedian, and a short line below submedian slightly inset; postmedial somewhat lunular, vertical from costa to vein 5, then outset, finer from vein 5 to vein 2; subterminal cross lines on interspaces, somewhat inangled from vein 5 to inner margin; a fine terminal line; between veins 5 and 2 the interspaces are faintly tinged with yellow. Hind wing white, the veins beyond cell hazel; an antemedial wavy line; postmedial line finer and more irregular; subterminal line not extending below vein 2. Wings below white, with the lines faintly indicated; no suffusions on fore wing, only a small round spot in cell, and a large spot on discocellular.

Expanse.—43 mm.

Habitat.—Hamburgerberg, Brazil.

Type.—Cat. No. 25605, U.S.N.M.

LIOPASIA PURPUREALIS, new species.

Female.—Palpi fuscous purple tipped with reddish, fringed below at base with white. Head dull bister brown with some darker scaling behind. Collar and patagia fuscous purple, the thorax medially dull bister brown. Abdomen above brownish purple, the dorsum with two lines of longer hairs; a large dorsal yellow spot near base, broadly edged in front with black and two white points. Body below and legs white. Fore wing purple; an elongated black spot irrorated with some yellow scales at middle of cell, below cell broader and inbent towards base on its proximal side, followed on its outer edge by some yellow markings; end of cell lilacine with a velvety brown irregular spot containing yellow scales; a curved velvety black shade on outer edge of discocellular with some yellow scales in front; a lilacine shade from cell to termen between veins 3 and 5; a black streak on submedian fold from medial shade to near termen with some yellow irrorations on it postmedially; a yellow spot from above vein 6 to close to termen, widest on costa and crossed by black subterminal spots, its outer edge indentate on vein 7; a yellow spot at tornus; subterminal black spots with yellow points, except between veins 4 and 5, the largest near inner margin; cilia fuscous and purple, but white at tornus. Hind wing fuscous brown, the cilia mostly tipped with white. Wings below brown black; base of costal margins streaked with white; fore wing with white spots at apex and tornus.

Expanse.—37 mm.

Habitat.—Yahuarmayo, Peru.

Type.—Cat. No. 25597, U.S.N.M.

ANARMODIA ARCADIUSALIS, new species.

Male.—Palpi peach red, the first joint white in front. Head, body above, and fore wing ochraceous orange; body underneath pale orange yellow; mid and fore tibiae, also base of fore tarsi ferruginous, the tarsi otherwise whitish. Fore wing irrorated with cinnamon rufous striae; antemedial line fine, fuscous, oblique from costa; a point in cell, and double line on discocellular; postmedial line fuscous faintly curved on costa, slightly inbent to inner margin followed from vein 6 to inner margin by a broad opalescent shade; cilia on inner margin fuscous, on termen crenulate, fuscous, tipped with white on interspaces. Hind wing opalescent maize yellow, the termen from apex to vein 2 broadly deep chrome, from vein 2 to anal angle fuscous; a black point on discocellular; a postmedial sinuous fuscous line from vein 6, not reaching inner margin. Wings underneath opalescent, the veins and termen broadly yellow ocher, the hind wing irrorated with silvery white scales; cellular mark-

ings as above: postmedial line of fore wing finer, seen in transparency; postmedial line of hind wing broader.

Expanse.—50 mm.

Habitat.—Carabaya, Peru.

Type.—Cat. No. 26047, U.S.N.M.

Allied to *A. inflexalis* Snellen, the fore wing broader, the apex acute, not falcate as in *inflexalis*, which also has the postmedial line of hind wing reaching costa.

ANARMODIA SALVTUSALIS, new species.

Male.—Palpi peach red, the first joint whitish fringed with capucine orange. Head, collar, and thorax capucine orange, the latter mixed with light orange yellow. Abdomen above orange yellow, underneath ferruginous; all the tibiae with ferruginous streaks, also base of fore tarsi, otherwise whitish. Fore wing capucine orange, the veins and lines army brown; an antemedial oblique line from costa to near middle of inner margin connected with postmedial by a dark line along inner margin; a minute point in cell and bar on discocellular; postmedial fine, well outcurved beyond cell and inbent to near middle of inner margin; cilia crenulate, army brown at base, white tipped on interspaces. Hind wing light orange yellow; a dark point on discocellular; a fine purplish postmedial line from vein 6 to just below vein 2; cilia brown tipped with white and with orange buff spots at veins 2–8. Fore wing below opalescent light orange yellow, the costa and termen dark shaded; point in cell larger the bar on discocellular well marked. Hind wing below with the margins silky pinkish cinnamon, the disk light purplish vinaceous with scattered white scales; a faint dark line on discocellular, the postmedial line barely visible.

Expanse.—40 mm.

Habitat.—Jimenez, West Colombia.

Type.—Cat. No. 26048, U.S.N.M.

Somewhat like *A. arcadiusalis* Schaus, the apex not acute and distinguished immediately by the postmedial line outcurved beyond cell.

ANARMODIA ELONGALIS, new species.

Male.—Palpi brown fringed with white below on basal half. Head and body bister, the collar darker tinged; abdomen with a lateral dark line, the venter whitish gray irrorated with black. Fore wing pale bister; basal third of costa darker shaded; the terminal half of costal margin broadly ochreous yellow; faint pale reddish brown streaks at base below cell, also in middle and end of cell; inner margin finely black; a black point at middle of cell; fine faint black lines on either side of discocellular; postmedial line fine, black,

with streaks on veins, outcurved below costa, inbent to near middle of inner margin, crossing a fuscous shade below vein 6 which extends to termen and apex; marginal dark shading on interspaces; a terminal dark punctiform line; cilia fuscous with white mottling near tornus. Hind wing thinly scaled, grayish, the veins ochre yellow; a dark line on discocellular; a postmedial fuscous line with black points on veins, very indistinct from vein 2 to inner margin; termen darker shaded; cilia white divided by a gray line and with fuscous spots at veins. Wings below paler, almost bone color with scattered black scales; the fore wings with a black streak on discocellular. The fore wing of this species is narrower for its length than in any other species in the genus.

Expanse.—40 mm.

Habitat.—Volcan de Santa Maria, Guatemala.

Type.—Cat. No. 25600, U.S.N.M.

ANARMODIA MONJEALIS, new species.

Male.—Palpi hay's brown, the base in front white. Head and collar sorghum brown. Thorax cinnamon drab. Abdomen light cinnamon drab above, underneath thickly irrorated with cinnamon drab; a sublateral white line on basal half; legs mostly vinaceous brown, the tarsi and hind tibiae white. Fore wing sayal brown, faintly iridescent; scales on inner margin white at base; a fine black antemedial line outcurved from costa; a black point in middle of cell; a small black annulus on discocellular; costa from above discocellular to apex narrowly ochraceous buff, crossed by the outer punctiform black line which is evenly outcurved from costa to vein 2, then inbent; fuscous black spots on interspaces beyond line from vein 5 to inner margin, generally suffusing between veins 3 and 5; cilia mostly black tipped with white. Hind wing thinly scaled suffused with iridescent cinnamon drab, darker shaded on termen; a fuscous line on discocellular; a fuscous postmedial line with projecting short black streaks on veins. Wings below light buff irrorated with fuscous; fore wing with a black point in cell, and spot on discocellular, outer dark streaks on veins, and dark shading on termen from vein 6 to tornus; costa of hind wing whitish, the postmedial line lunular dentate from vein 5 to near inner margin; both wings with an interrupted marginal line.

Expanse.—45 mm.

Habitat.—Loja, Ecuador.

Type.—Cat. No. 26049, U.S.N.M.

Several specimens received from Mr. Dognin who has a paratype in his collection. Near *A. bistralis* Guence.

ANARMODIA LOJALIS, new species.

Male.—Palpi pecan brown, the base in front white. Frons pecan brown; vertex and collar vinaceous tawny; thorax and abdomen above cinnamon drab, underneath whitish, the venter with a few dark irrorations; fore and mid tibiae and basal joint of fore tarsi cinnamon drab, hind tibiae and tarsi white. Fore wing vinaceous tawny; a fine black antemedial line wavyly outbent to below cell, then downbent to just below vein 1; a black point in cell; a small black annulus on discocellular, its proximal side more heavily marked; outer line black, punctiform, evenly outcurved to vein 2 then inbent, linear, followed by fuscous suffusions on interspaces; cilia fuscous. Hind wing thickly scaled golden cinnamon buff; a black point on discocellular; a postmedial fuscous black line with black streaks on veins; termen suffused with fuscous black narrowing to anal angle; veins terminally orange buff; cilia smoky gray tipped with white and with black spots at veins. Fore wing below light pinkish cinnamon, the veins whitish; termen darker shaded; point in cell, and discocellular spot larger, black; minute black outer streaks on veins and a black spot on costa; linear black marginal spots on interspaces. Hind wing below whitish, only faintly suffused with light pinkish cinnamon; fuscous and silvery white irrorations scattered over the wing; a black point on discocellular; the postmedial line lunular dentate; an incomplete black line on margin.

Expanse.—42 mm.

Habitat.—Loja, Ecuador.

Type.—Cat. No. 26050, U.S.N.M.

A paratype in collection Dognin.

Closely allied to *A. corylalis* Guenée and *A. longinqualis* Lederer.

ANARMODIA REPANDALIS, new species.

Male.—Palpi russet, basal half in front white. Body above ochraceous tawny, somewhat darker on collar and terminal segments of abdomen; a sublateral mars brown line on abdomen; body below white; legs and tarsi white, the mid tibiae, upper side of fore tibiae, and base of fore tarsi brownish drab. Fore wing ochraceous tawny with tawny irrorations, the termen from below vein 7 to inner margin broadly natal brown; a fine dark antemedial line, very oblique and straight to near middle of inner margin; a dark point in cell and curved line on discocellular; postmedial line fine connecting short dark streaks on veins, well outcurved beyond cell; a fuscous marginal line interrupted by veins; cilia fuscous. Hind wing yellow ocher; a dark streak on upper discocellular; a fine black postmedial line curved below costa, not quite reaching inner margin; an interrupted

terminal fuscous black line preceded by smoky suffusions on interspaces above vein 5; cilia dark tipped with white on anal half. Fore wing below pale ochraceous buff, the terminal area cinnamon drab with fuscous black irrorations between veins 3 and 5; point in cell and discocellular line more pronounced; marginal line as above. Hind wing below whitish irrorated with brownish drab; a short black line on upper discocellular; postmedial line punctiform from costa to vein 3, then dentate, interrupted on anal fold; irrorations forming a broad shade on terminal area; an interrupted terminal line.

Expanse.—40 mm.

Habitat.—La Union, Carabaya, Peru.

Type.—Cat. No. 26046, U.S.N.M.

Received from Paul Dognin who has a paratype in his collection.

Comes nearest *A. remotalis* Dognin which has the antemedial line curved and the apex more produced.

MICROCAUSTA DEMERIDALIS, new species.

Female.—Palpi outwardly black, inwardly white. Head, collar, thorax, and fore wing yellow ocher. Abdomen gray with dorsal black points. Legs whitish ocher, the fore tibiae and tarsi gray. Fore wing: basal third of costa black; a large black spot medially on costa; a black antemedial point below cell with inbent black scaling below it expanding on inner margin; from medial spot a fine sinuous line of black scales to inner margin; some black scales on discocellular; a remote postmedial black line, thick and vertical from costa to vein 5, then fine, dentate, inbent to vein 2 and again vertical to inner margin followed by some scattered black scales; terminal interspaces streaked with silvery gray; large terminal black points on veins; cilia silvery mottled with black hairs. Hind wing thinly scaled, smoky gray; cilia mostly white. Wings below smoky gray, the fore wing showing faintly a brownish tinge and traces of a medial spot and outer line.

Expanse.—27 mm.

Habitat.—Volcan de Santa Maria, Guatemala.

Type.—Cat. No. 25599, U.S.N.M.

BAEOTARCHA FALLALIS, new species.

Male.—Palpi brown above, white below. Frons grayish brown edged with white; vertex whitish. Collar and thorax gray brown. Abdomen gray brown with white segmental lines and white anal hairs. Legs light brown, tarsi white. Fore wing pale straw color; costal margin to above end of cell benzo brown; base of cell, a small round spot medially below subcostal, and a large spot at end of cell

amber brown; a thick antemedial amber brown line, almost vertical, crossed by a fine dark streak below cell and some dark irrorations on submedian fold; a postmedial narrower line outbent from costa and outcurved beyond cell to vein 2, then slightly inbent to inner margin where it is connected with the antemedial line by a fine dark line; a fine terminal brown line; cilia white. Hind wing semihyaline white; a short postmedial fuscous line from vein 5 to vein 2; small terminal spots not extending below vein 2. Fore wing below white without dark shading on costa; no antemedial line, only a short streak below cell; a dark point in cell and annular spot at end of cell; postmedial line thickest at costa.

Expanse.—21 mm.

Habitat.—Castro Parana, Brazil.

Type.—Cat. No. 25595, U.S.N.M.

Subfamily CRAMBINAE.

CHILO GILDASELLUS, new species.

Female.—Palpi, head, and body tawny, the patagia dorsally fringed with antimony yellow, the abdomen above with similar segmental lines; abdomen below buff white. Fore wing glossy antimony yellow; costal margin fuscous; a tawny streak on subcostal and one below median; a black and white point at origin of vein 2, and a similar point below it, slightly outset on submedian; some tawny scales on discocellular; black and white scaling on veins 4 and 3 near cell, also on vein 2, these last extending along vein to near termen; small subterminal clusters of similar scales on veins 3 to 5, also clusters near termen on veins 6 and 7; cilia yellowish white. Hind wing white, the termen faintly shaded with grayish yellow; cilia white. Fore wing below and costa of hind wing pale clay color.

Expanse.—31 mm.

Habitat.—Formosa, Argentina.

Type.—Cat. No. 26073, U.S.N.M.

Collected by P. Jorgensen.

NOTES ON THE OSTEOLOGY AND DENTITION OF THE GENERA *DESMOSTYLUS* AND *CORNWALLIUS*.

By OLIVER P. HAY,

Associate of the Carnegie Institution, of Washington.

From Dr. Edward M. Kindle, of the Canada Geological Survey, the writer has received for examination a large tooth of *Desmostylus*, which was presented to the Victoria Memorial Museum, at Ottawa, by Dr. C. W. Newcombe, of Victoria, British Columbia. It had been purchased from a dealer in curiosities and was reported to have been brought from Alaska. This report may be true, but it is hardly to be depended upon. The tooth no doubt belongs to *Desmostylus*, but inasmuch as neither the locality nor the formation is known it would be unsafe to identify it specifically. It appears to be a left upper molar.

The tooth sent from Victoria (pl. 1, figs. 1, 2) had not yet come into use, the unabraded summits of its columns showing each the peculiar depression and central nipple-like elevation. Only the base of the root is present, and there are indications that it consisted of two fangs. The greatest length of the tooth is 61 mm.; the height 57 mm., including the base of the root. From the edge of the enamel to the summit of the columns is 51 mm. The thickness, where greatest, is 38 mm. The tooth consists of eight columns. Of these, three form a front transverse row; then come two rows, each of two columns; and at the rear is a single column. The transverse rows are oblique to the axis of the tooth, being directed from the outside inward and backward, as may be seen by figure 1 cited.

As will be observed, the intervals between the columns are occupied by cement, and this is of a lighter color than the surface of the enamel. This cement rises from the root to the summit of the columns. Below the bases of the second and the third columns the cement continues to the center of the base of the root, lying evidently in a valley which seems to mark the division of the root into two fangs. The front of the tooth presents two tracts of cement, one on each side of the median column, and it spreads over the front of these anterior columns nearly half way to their summits. It is probable that originally a large part of the crown was

covered with a thin coat of cement. On the inner face of the tooth there still adheres a part of the maxillary bone. So far as the writer sees, it is impossible to determine where in the molar series this tooth belongs. No surface shows contact with a tooth in front or behind.

The determination of the dentition of *Desmostylus* is a matter of great interest. An examination of Yoshiwara and Iwasaki's figures¹ shows that there is, in front of their first molar, a small tooth consisting of only four columns. In the skull from Oregon, which the writer described in 1915,² there is in front of a molar (pl. 57, 23) apparently corresponding to that figured by the Japanese authors, and composed of the same number of columns, 8, the base of a smaller tooth which was regarded as the first molar (pl. 57, 22). This supposed first molar, instead of being made up of eight columns, appears to have only five. The tooth in front of this (pl. 57, 21) is represented by the base of the crown and the root, and it has a diameter of 17 mm. On plate 58 of the paper cited, was presented the figure of a tooth which had four columns and which was believed to be the fourth premolar. This appears to correspond to the hinder premolar described by Yoshiwara and Iwasaki. Now, according to these identifications, the Oregon skull differs from the one found in Japan in having between the supposed last premolar with four columns and the molar with eight columns another tooth possessing apparently only five columns. It is improbable that the two species differed in such an important respect.

An examination of my figure³ shows that the molar indicated by 23 was emerging behind and above the supposed first molar 22. This tooth 22 can hardly be a premolar, for this might be expected to appear only after the molar behind it had come into action. One might insist also that it is not a milk tooth, because there appears to be no premolar to replace it, as shown by Yoshiwara and Iwasaki's figure. Plate 2 of the Japanese authors shows that another molar (their M²) was moving downward and forward to take its place against the molar then in action—that is, it appears that the upper molars, on coming into place, move downward and forward as in the mastodons and elephants.

If, now, we grant that, as the supposed first molar (22) of the Oregon specimen became worn down, the next molar (23) moved forward, pushed it out, and took its place, the condition seen in Yoshiwara and Iwasaki's specimen would be produced. According to this interpretation, the hinder premolar of the paper last cited

¹ Journ. Coll. Sci., Japan, Imp. Univ., vol. 16, 1902, pl. 2; pl. 3, fig. 4.

² Proc. U. S. Nat. Mus., vol. 49, p. 381, pl. 57.

³ Idem, pl. 57.

would be the fourth premolar and the tooth immediately behind it the second molar, while the molar shown at a distance behind would be the third.

In 1923⁴ the writer proposed the new name *Cornwallius*, based on *Desmostylus sookensis* Cornwall.⁵ Through Director Francis Ker-mode, of the Provincial Museum of Natural History, Victoria, British Columbia, the writer received for examination both of the teeth figured by Cornwall. These teeth are illustrated on the plates (pl. 1, figs. 4, 5, and pl. 2, figs. 1-5).

It has occurred to the writer that these teeth may be milk teeth of *Desmostylus* and that the larger one (pl. 1, figs. 1, 2, pl. 2, figs. 4, 5) may correspond to that called in my paper of 1915 the first molar. The tooth is of appropriate size. The length is 48.5 mm., the width 34 mm. The corresponding dimensions of what the writer regarded as the first molar⁶ were estimated to be in length 40 mm., and width 28 mm., but the measurements were taken at the somewhat narrowed base of the tooth. The low crown of the tooth of *C. sookensis* accords with the idea that it is a milk tooth.

It seems certain that the tooth which in my paper of 1915 (pl. 57) was designated by the numeral 21 is either a milk molar or the premolar which would follow it; also that it corresponds in position to the tooth Pm of Yoshiwara and Iwasaki's plate 2, and to the small tooth of their plate 3, figure 4. The Oregon skull belonged evidently to a younger animal than did the Japanese skull. In the latter it seems that the premolar, if such it is, had not yet been pushed out to the level of the molar behind it. In the Oregon specimen it is possible that the milk tooth 21 had not yet been replaced.

As already said, the tooth designated 23 was lying immediately above the greater part of the tooth 22. The former might, therefore, be taken as fourth premolar. Because of the great size of the tooth and the number of its columns, this appears wholly unlikely. The tooth 23 must be a molar.

We may possibly get an explanation of the dentition of *Desmostylus* from that of the mastodons. In some of these the premolars are retarded in their development, in others even wholly suppressed. The suppression of premolars began with the hindermost one. The same modification of the dentition has been demonstrated in the *Sirenia*. In the earliest members of the group, as *Protosiren frassi*,⁷ the tooth formula was the typical one, i. 3, c. i, pm. 4, m. 3. According to Andrews⁸ the dental formula was the same in *Eotherium aegypticum*. Abel tells us that since the middle Eocene there has

⁴ Pan-Amer. Geologist, vol. 39, p. 106, text-fig. 4.

⁵ Canad. Field-Naturalist, vol. 36, p. 122, 4 figs.

⁶ Proc. U. S. Nat. Mus., vol. 49, pl. 57, 22.

⁷ Abel, Jahrb. Min., Geol., Pal., 1906, vol. 2, pp. 50, 51.

⁸ Cat. Tert. Vert. Fayum, 1906, p. 207.

been a progressive reduction of the replacement teeth. In *Halitherium* the hindermost premolar was not developed, and the corresponding milk tooth assumed the form of a molar.

We may then regard it as possible that the tooth 22 of my plate 57 is a milk tooth which was assuming the form of a molar, and which was not to be displaced by a premolar, but by the first molar. The tooth in front of it is then the third premolar, or the corresponding milk molar. A deep pit in front of it represents the second premolar or milk molar, and a minute pit in front of that represents the first juvenile tooth.

As to the tooth on which I based the genus *Cornwallius* it is then possible that it is the hindermost milk tooth of *Desmostylus*; but this is for the future to determine. I proceed to give a description of it:

The tooth (pls. 1, 2, figs. 4, 5) has suffered some loss of enamel on two columns, as shown by the figures. All of the columns have suffered some wear, but that they were of small height originally is evident. In two of them the wear had not reached the core of dentine. The columns taper rapidly from the base to the summit. Text figure 1 presents a view of this tooth before a fragment of the second inner column had been cemented in its place. It shows that the dentine core, broad at its base, tapers rapidly to its summit, as was necessary in a low-crowned tooth. As



FIG. 1.—TOOTH OF *CORNWALLIUS*
SOOKENSIS. VIEW FROM INNER
SIDE. TYPE.

seen from the figures, there are in front two large columns, and behind these two somewhat smaller ones. At the rear is a column of which a part is gone. It appears quite certain that the snag of enamel at the right of the gap (pl. 1, fig. 4) formed part of a cusp which adhered to the hinder column. Whether it could be counted as the sixth column is doubtful. The tooth is taken to belong in the right maxilla.

The length, measured in the axis of the tooth, is 45 mm.; the total length 48.5 mm.; the greatest thickness, 34 mm.; the height of the crown in front, 23 mm. On the front end there is a cingulum which does not occupy the whole width of the tooth. At the inner end of this are two small cusps. Rootward from the edge of this cingulum there is a surface 10 mm. long and 4 mm. deep, which is worn from contact with a tooth in front. Between the cingulum and the grinding surface there is on each of the two anterior columns an extensive worn surface. No such surface is seen on the hinder end of the tooth. The cingulum is not developed on the sides and rear of the tooth; but at the outer end of the first transverse valley there is a large tubercle, worn at the summit and showing a pit of dentine. At

the inner end of the same valley is a much smaller tubercle. A single tubercle appears at the outer end of the second valley and is closely applied against the hindermost column. The rear of this column is missing.

There belonged to this tooth quite certainly two roots, but these are broken off (pl. 2, fig. 5). A considerable pulp cavity remains, 27 mm. long and 15 mm. wide. It is slightly constricted near the middle of the length, indicating thus the parting of the roots.

From Director Kermode was received also the tooth which was described and figured in 1917⁹, as *Desmostylus hesperus*, and which Cornwall, in his paper cited, figured as *Desmostylus sookensis*. It was found in the sandstone cliffs near the mouth of Coal Creek, British Columbia, by Miss M. Egerton. It was sent to L. M. Lambe, paleontologist in the Geological Survey, Ottawa, whose remarks on it are published on the page above cited. Mr. Lambe identified it provisionally as the upper right first molar. He did this possibly relying on my identification of the first molar in my paper of 1915.

The length of the tooth (pl. 2, figs. 1-3) is 33 mm.; the width 24 mm.; the height of the crown, 16 mm. It is somewhat more worn than the tooth described in the previous paragraph, but it is evident that the columns were originally low. It had two well-developed roots (pl. 2, fig. 3) of equal size. These are now broken off squarely just below the crown. The transverse diameters of these roots are close to 18 mm. At the plane of fracture they are not entirely separated from each other. The tooth is supposed to belong to the left side of the lower jaw, because the cingulum is better developed on the left side of the tooth. It consists of six columns arranged in three transverse pairs. Of the anterior pair the inner column is the largest of all. The inner column of the third pair is very small and the wear had not exposed the dentine. Cornwall, perhaps correctly, did not count it as one of the columns. On the front of the tooth, in the midline, is a broad tubercle which may be regarded as a talon or a part of a cingulum. On the outer face there is a slight cingulum-like ridge at the bases of the two front columns. Between the second and third columns is a tubercle or cusp. On the inner face there is little or no trace of the cingulum. On the front end of this tooth there is an extensive surface polished by contact with a tooth in front. This begins at the level of the grinding surface and descends not only to the talon, but in a narrowing strip nearly to the base of the crown. Above the talon the polished surface is 15 mm. wide from side to side. A small polished surface is found on the hinder end of the tooth.

⁹ Rep. Provincial Mus. Nat. Hist., Victoria, B. C., for 1916, p. 42, pl. 9, figs. 2, 3.

This tooth does not agree in structure with any yet described. It most resembles the teeth described by Yoshiwara and Iwasaki¹⁰ as lower second premolars. In those teeth, however, there are three columns in the hinder transverse row.

There are some reasons why the larger of the two teeth referred to *Cornwallius sookensis* can not be regarded as identical with the tooth 23 of the Oregon specimen. These are as follows:

(1) The outer border of the Oregon tooth is straight; in the Victoria tooth this border is strongly curved. (2) The transverse rows of columns in the Oregon tooth appear to be arranged more obliquely to the long axis of the tooth than in that from Victoria. (3) The hinder end of the Victoria tooth is considerably broader than in the one from Oregon.

Until some lucky discovery shall decide the matter one way or the other, the writer proposes to maintain the genus *Cornwallius* and to regard the larger of the two teeth (pls. 1, 2, figs. 4, 5) as an upper molar, and the smaller one (pl. 2, figs. 1-3) as a lower molar, not the hindermost. The larger tooth is taken as the special type of *Cornwallius sookensis*.

The cliffs in the vicinity of Sooke, Vancouver Island, ought to be carefully and frequently searched for additional materials of this sirenian.

In their description of the skull of *Desmostylus* Yoshiwara and Iwasaki attribute to *Desmostylus* two pairs of lower tusks and one pair of upper ones. The lower tusks projected some distance from the jaw. The upper tusks were said not to have yet come into full growth, only the left tooth being slightly visible beneath the ruptured surface of the maxilla. Their figure¹¹ shows what was seen of this tusk.

In my description of *Desmostylus* from Oregon I referred to what seemed to be an upper tusk. Although this was said¹² to show only on the right side, there is on each side a projection at the front of the specimen which represents the same structure. As shown by my figures, a fragment of the snout about 30 mm. long had been broken off in exhuming the skull and had later been cemented in its place. Recently, wishing to come to a decision regarding this supposed tusk, the writer removed the fragment and cleaned off both surfaces of the break. The view presented was not satisfactory. The circumference of the supposed tusk could not be traced on the side next the mid-line. Next, the matrix was ground down and polished to see whether any structure was hidden. What was revealed is shown in figure 3 of plate 1. On each side there ap-

¹⁰ Pl. 3, figs. 2 and 3.

¹¹ Journ. Coll. Sci., Japan. Imp. Univ., vol. 16, 1902, pl. 1, Up I.

¹² Proc. U. S. Nat. Mus., vol. 44, p. 391.

peared a number of cell-like spaces separated by thin walls of bone. It is evident that we have here a section across the right and left maxilloturbinal bones. There is no trace whatever of any upper tusk.

The writer is led, therefore, to question the existence of an upper tusk in the Japanese specimen. What the describers very naturally took to be a tusk may be only the sandstone cast of one side of the nasal cavity. Over the surface of the cast naturally adhered some flakes of bone. Had a section been made across this region, the maxilloturbinal would probably have been discovered. The formerly supposed tusk of the Oregon specimen where it projects in front has the appearance of the end of a turbinal bone. In this specimen the bone seems to end a little behind the middle of the length of the nasal opening. Although in the Japanese specimen the supposed tusk is shown as continuing nearly to the front of the

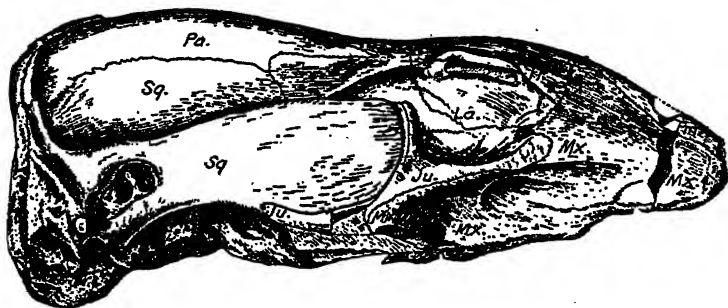


FIG. 2.—SIDE VIEW OF SKULL OF *DESMOSTYLUS HESPERUS*. *Fr*, FRONTAL; *Ju*, JUGAL; *La*, LACRYMAL; *Pa*, PARIETAL; *Ma*, MAXILLA; *Na*, NASAL; *Pr*, PREMAXILLA; *Sq*, SQUAMOSAL.

nasal opening, it is possible that only the rounded surface of the matrix was seen.

Recently¹³ in the discussion of the position and connections of the jugal bone in *Desmostylus*, the writer published a figure illustrating the right side of the skull of the Oregon specimen. Through inadvertence the lower branch of the hinder end of the frontal bone was represented as cut off by a suture and was lettered *os*. This figure is here reproduced (text fig. 2) with the necessary correction. It will be seen that the jugal terminates at about the middle of the lower border of the zygomatic process of the squamosal.

In his paper of 1923 just cited the writer proposed to divide the Sirenia into two suborders, *Desmostyliiformes* and *Trichechiformes*. Some of the characters of the *Desmostyliiformes* may be expressed as follows:

Postorbital part of the skull broad and depressed. Preorbital part narrowed and moderately decurved. Temporal ridges feebly

¹³ Pan-Amer. Geologist, vol. 39, p. 108, text fig. 5.

developed. External nares far in front of the orbits. Nasal bones well developed, embraced by the premaxillae. Periotic bones tightly wedged among the adjacent bones. Grinding teeth composed of closely adhering columns, usually hypsodont. Enamel very thick. Two pairs of tusks in lower jaw; none in upper jaw. Genera *Desmostylus* and *Cornwallius*.

EXPLANATION OF PLATES.

PLATE 1.

Figs. 1-3. *Desmostylus*. Teeth and part of skull. $\times 1$.

1. Upper left molar of undetermined species of *Desmostylus*. Showing unworn grinding surface. On the left is a patch of the maxilla, *mx*. Between the columns of the teeth is seen the cement. Front end upward.
2. View of same tooth showing the outer face. Front end toward the left. Between the columns are seen the tracts of cement. At the bottom of the figure the layer of cement passes between the bases of two fangs of the root.
3. Section across the snout of *Desmostylus hesperus*. Showing sections across maxilloturbinal bones.
4. Supposed upper molar of *Cornwallius sookensis*. Showing grinding surface. Type. Front end upward.
5. Same molar showing the outer face. Front of tooth toward the left.

PLATE 2.

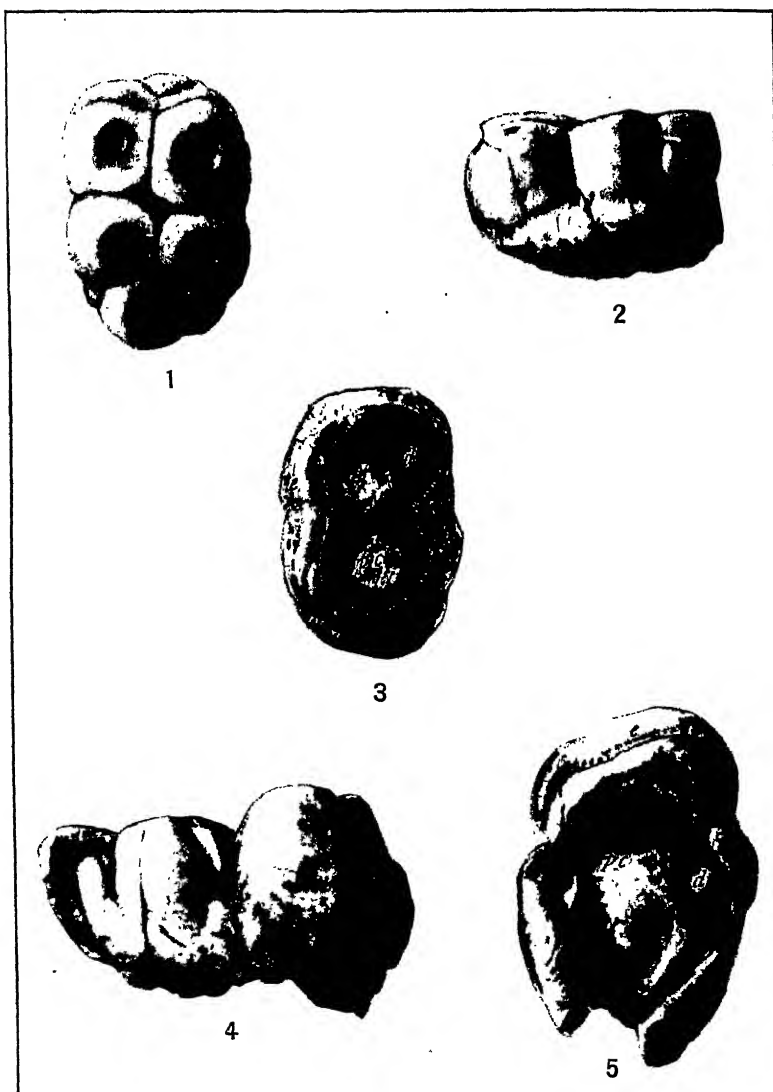
Figs. 1-5. Teeth of *Cornwallius sookensis* (Cornwall). $\times 1$.

1. Supposed left lower molar. Showing grinding surface. Front end upwards.
2. View of same tooth. Showing outer face. Front end toward left.
3. View of same tooth, showing a section of fracture across the base of the root. Surrounding all is the enamel (*e*) of the crown. Inside of this is seen the blackened dentine (*d*). In the center of each fang is seen the matrix filling the pulp cavity (*p. c.*). Front end upward.
4. View of supposed upper molar. Showing the inner face. Front end toward right.
5. View of same molar. Showing, around all, the base of the enamel *e*. Within this is the blackened layer of dentine, *d*. Within this is seen the yet large pulp cavity, *pc*. The front part of this is in a deep shadow. Front end upward.



DESMOSTYLUS AND CORNWALLIUS

FOR EXPLANATION OF PLATE SEE PAGE 8



TEETH OF CORNWALLIUS

FOR EXPLANATION OF PLATE SEE PAGE 8

A REVISION OF THE WEST INDIAN COLEOPTERA OF THE FAMILY BUPRESTIDAE

By WARREN S. FISHER

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INTRODUCTION

The present paper is the results of a study of the material of this family from the West Indies found in the collection of the United States National Museum, together with such material as could be borrowed from other sources. Specimens have been received at various times for identification, but since the material in the collection was mostly unidentified, the descriptions widely scattered, and the species of the family from that region having never been treated in a synoptical way, it seemed advisable to bring together as much material from other sources as possible, so that the subject could be treated in a more exhaustive manner, which would facilitate the identification of material by future students.

Three-fourths of the number of species of BUPRESTIDAE hitherto known to inhabit the West Indies have been studied by the writer in the preparation of this paper, the 21 species not seen by him, so far as known, are represented mostly by unique types which were not available for study. The adults of this family, although abundant in nature, are so agile that their capture by collectors are not frequent and the fauna here treated appears to have been greatly neglected, but by assembling material from a number of Museums and private collections, a fairly good representation has been brought together, so that in addition to the 80 species previously known, one new genus, and 26 more species are described as new.

The BUPRESTIDAE of the West Indies have been treated by a number of authors in a general way. Jacquelin Duval was the first of these authors to consider this family from that region¹ (published in French and reissued the same year in a Spanish edition), and records five genera and 12 species, 4 of which are described as new. Auguste

¹ Ramon de la Sagra's *Histoire physique, politique et naturelle de l'île de Cuba*, 1853, pp. 56-65.

Chevrolat in his *Coléoptères de l'île de Cuba*² records 16 genera and 30 species from material in the collections of Gundlach, Poey, and Chevrolat, of which 11 are described as new. Dr. A. Stahl³ lists two species, one each of the genus *Buprestis* and *Chrysobothris* from Porto Rico. Ed. Fleutiaux and A. Sallé published a *List des Coléoptères de la Guadeloupe*⁴ in which they record 9 genera and 14 species from Guadeloupe, one of which is described as new. Dr. Juan Gundlach⁵ records the same number of genera and species from Cuba as Chevrolat, without describing any new species, but giving more definite localities for the species. The same author, in *La Fauna Puerto Riqueña*,⁶ lists 2 genera and 4 species from Porto Rico. Charles W. Leng and Andrew Mutchler, in *A Preliminary List of the Coleoptera of the West Indies as Recorded to January 1, 1914*,⁷ list 24 genera and 66 species from that region, which are decreased by synonymy in their supplement to the above paper⁸ to 64 species.

In the present paper are included 29 genera and 107 species.

The term West Indies as used in the present paper includes the islands lying in the Caribbean Sea and Gulf of Mexico and may be divided into four groups. First the Bahamas, which consist of about 700 small islands, composed mostly of low lying heaps of calcareous shell and coral debris deposited on a submarine plateau of vast area, forming a submerged link with the mainland of Florida; second the Greater Antilles, including Cuba, Jamaica, Haiti, Porto Rico, and the Virgin Islands, of these Haiti is the center and summit of the Antillean Range, and from Mount Tina, which is 10,000 feet above the sea level, the Antilles slope gently down to western Cuba and Jamaica, and to the Virgin Islands on the east; third the Lesser Antilles, consisting of a large number of small islands lying in two rows, an outer row of limestone and coral inlets and an inner row of volcanic formation; and fourth a number of islands lying along the northern coast of South America, of which Trinidad and Tobago are the most important, and which in a remote period were severed from the continent by the wearing of the equatorial currents. These islands, with the exception of those along the northern coast of South America, are supposed to be of more recent formation than the portions of the adjacent continents. The Greater Antilles during the Tertiary period are supposed to have been a series of active vol-

² Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, pp. 571-616.

³ Fauna de Puerto Rico, 1882, p. 171.

⁴ Ann. Soc. Ent. France, ser. 6, vol. 9, 1889 (published in 1890), pp. 425-484.

⁵ Contribucion a la Entomologia Cubana, vol. 3, pt. 5, 1891. (Issued in sheets with the *Anales R. Acad. Cien. Havana*.)

⁶ Ann. Soc. Españ. Hist. Nat., ser. 2, vol. 22, 1894, p. 623.

⁷ Bull. Amer. Mus. Nat. Hist., vol. 33, 1914, pp. 423-431.

⁸ Idem, vol. 37, 1917, p. 205.

canoes, attaining a considerably higher elevation than at present and forming a single large island.

The climate of these islands varies according to the elevation, latitude, and to some extent by the degree to which they are exposed to the influence of the trade winds and warm ocean currents, but as a rule it is purely tropical. These conditions offer a bewildering variety of tropical fauna, but whose distribution is by no means uniform. The low lying Bahamas provide little support for vegetation and some are almost barren.

Researches by Charles Simpson⁹ and those of John Small^{10, 11} have shown a close affinity between the fauna of the extreme southern part of Florida, the Florida Keys, and some of the Antilles, just as the fauna of the islands along the northern coast of South America is allied to that of the coast with which they were once connected. In the Greater Antilles the forests are tropical, in some parts consisting of various species of palms, mahogany, tree ferns, and various trees furnishing edible fruits, while on the upper slopes the fauna becomes more characteristic of the temperate zone, and up to an elevation of 4,000 feet are often clothed with pines; farther up, with increased precipitation, rank growth of deciduous trees appear, while the summits are thickly overgrown with ferns.

Since the species are more or less limited in their distribution to certain islands, and on account of the great variety of plants and variation in the temperature, the family Buprestidae from this region should be exceedingly rich in species. Very little collecting has been done, especially in the mountainous sections, where are to be expected a number of new forms. This is especially true of the smaller species, which are mostly leaf and twig miners, and since these forms have been practically neglected by collectors, the number of species will be largely increased by careful collecting.

As the descriptions of the species are widely scattered throughout various publications, some of which are not available to most students, each species is herein redescribed from specimens which are as nearly typical as is possible for the writer to determine from the descriptions. Where specimens of a species are not available for study, a translation of the original description is given.

No attempt has been made to give a complete bibliography; only the more important papers and those which apply to the region covered by the present paper have been cited. References to the species listed in the Leng and Mutchler Catalogue, which has been of the greatest aid to the writer, have not been cited under the species. The collector's name, when known, is given in parenthesis after the local-

⁹ Lower Florida Wilds, 1920.

¹⁰ Flora of Miami, Florida, 1913.

¹¹ Journ. New York Botanical Garden, 1916, 1917, and 1918.

ity record, and the collections in which the various species are located are also indicated.

The writer greatly appreciates the loan of material during his study of this family and wishes to thank the following entomologists for their assistance: Nathan Banks, Museum of Comparative Zoology, Cambridge, Mass., for a collection made by Dr. W. M. Mann in Haiti; Dr. Henry Skinner, for a collection from the Academy of Natural Sciences of Philadelphia, containing the Poey collection from Cuba; Dr. W. J. Holland, for material from his private collection, as well as for the loan of material from the Carnegie Museum of Pittsburgh, collected on the Isle of Pines and Jamaica; Prof. H. F. Wickham, University of Iowa, for material from the Bahamas and Haiti; and George N. Wolcott, of the Insular Experiment Station, Rio Piedras, Porto Rico, for material collected in Porto Rico. G. B. Merrill, Gainesville, Florida; E. G. Smyth, Bureau of Entomology, United States Department of Agriculture; and Frank B. Mason, Philadelphia, have also furnished valuable additions to the material studied. Stephen C. Bruner, chief of the Department of Entomology and Vegetable Pathology, Estacion Experimental agronomica, Santiago de las Vegas, Cuba, has sent an interesting collection taken in Cuba, and has also examined the material in the Gundlach Museum at Habana and furnished the writer with a list of the species contained in that collection. The writer is under great obligations to Dr. F. E. Lutz and A. J. Mutchler for the loan of a valuable collection from the American Museum of Natural History, including collections made by the expeditions conducted by that museum to the various islands in the West Indies, and also those made by the New York Academy of Sciences in conjunction with the museum, as well as other material collected by private individuals and sent to that museum for identification. I am especially indebted to Dr. Charles J. Gahan for the loan of material from the British Museum. This collection contained many species which had been compared with the types of Thompson, Gory, Chevrolat, etc., by the late Charles O. Waterhouse, and has been of the greatest help in my studies.

The writer desires to express his deep appreciation and sincere gratitude to Dr. E. A. Schwarz, of the United States National Museum, for the many helpful suggestions during the course of the work, for his kind and valuable criticism, and for aiding generally in every possible way in the preparation of this paper.

CLASSIFICATION

The family of Coleoptera treated in the present paper has been a great favorite with collectors on account of the large size and

splendid color of many of the species which compose it. The species are generally elongate and more or less cylindrical, although some are very robust and appear ungraceful in form, but this is compensated by the incomparable richness of their colors and markings, and for this reason they have been named "Richards" by some of the older authors. The larvae are variable in form, and live in both living and dead plants, and the adults are found feeding on the flowers and foliage of various plants, or sunning themselves on the trunks of trees during the warmer part of the day.

The genera as defined in the following paper may be tabulated as follows:

KEY TO THE GENERA

1. Sternal cavity formed entirely by the mesosternum (tribe Polycestini)..... 2.
Sternal cavity formed by the mesosternum and metasternum, or entirely by the metasternum..... 3.
2. Scutellum visible; tarsal claws simple..... Polycesta Solier.
Scutellum invisible; tarsal claws dentate..... Acmacodera Eschscholtz.
3. Sternal cavity formed by the mesosternum and metasternum; lateral branches of the metasternum elongate..... 4
Sternal cavity formed nearly or entirely by the metasternum lateral branches of the metasternum very short and compressed on the sides or invisible..... 22.
4. Antennal pores diffused upon both sides of the serrate joints (tribe Chalcoophorini)..... 5.
Antennal pores concentrated in a pit on the serrate joints..... 11.
5. First joint of posterior tarsi short, only a little longer than the second joint..... 6.
First joint of posterior tarsi long, as long, or nearly as long as the following two joints united..... 7.
6. Prosternal process longitudinally grooved..... Psiloptera Solier.
Prosternal process not longitudinally grooved..... Euchroma Solier.
7. Tarsi more or less depressed..... 8.
Tarsi laterally compressed..... Pelecopselaphus Solier.
8. Pronotum with a longitudinal median groove or carina..... 9.
Pronotum without a longitudinal median groove or carina..... Chrysesthes Solier.
9. Hind margin of posterior coxae strongly dentate between two emarginations..... Hilarotes Thomson.
Hind margin of posterior coxae normal, not dentate..... 10.
10. Prosternal process longitudinally grooved..... Chalcoophora Solier.
Prosternal process not longitudinally grooved..... Halecia Castelnau and Gory.
11. Front of head narrowed by the insertion of the antennae (tribe Chrysobothrini)..... 12.
Front of head not narrowed by the insertion of the antennae (tribe BUPRESTINI)..... 13.
12. Third tarsal joint armed with two long spines..... Actenodes Lacordaire.
Third tarsal joint unarmed..... Chrysobothris Eschscholtz.
13. Metasternal epimeron entirely uncovered..... 14.
Metasternal epimeron partially concealed by the lateral prolongation of the abdomen..... 19.

14. Eyes oblique and distinctly converging above----- 15.
 Eyes parallel or only feebly converging above----- 17.
15. First joint of posterior tarsi longer than the second----- 16.
 First joint of posterior tarsi not longer than the second.
Dicerca Eschscholtz.
16. Pronotum wider in front than behind; body subcylindrical.
Paracinyra Fisher.
 Pronotum narrower in front than behind; body not subcylindrical.
Cinyra Castelnau and Gory.
17. Pronotum with three more or less deep depressions at the base----- 18.
 Pronotum without three depressions at base, sometimes longitudinally sulcate at the middle----- *Buprestis* Linnaeus
18. Pronotum wider in front than behind----- *Mixochlorus* Waterhouse.
 Pronotum narrower in front than behind----- *Peronaemis* Waterhouse.
19. Antennal cavities concealed by a transversely oblique carina.
Aglaostola Thomson.
 Antennal cavities small, rounded, and not concealed by a carina----- 20.
20. Pronotum distinctly sinuate at base----- 21.
 Pronotum truncate or only feebly sinuate at base----- *Anthaxia* Eschscholtz.
21. Elytra long, covering the abdomen----- *Melanophila* Eschscholtz.
 Elytra short, not covering the abdomen----- *Tetragonoschema* Thomson.
22. Sternal cavity formed almost entirely by the metasternum; base of pronotum more or less sinuate (tribe Agrilini)----- 23.
 Sternal cavity formed entirely by the metasternum; base of pronotum truncate (tribe Mastogenini)----- 28.
23. Middle coxae more widely separated than the anterior ones----- 24.
 Middle coxae not more widely separated than the anterior ones----- 27.
24. Antennae lodged in a distinct deep groove in the prosternum----- 25.
 Antennae free in repose, not lodged in a groove in the prosternum.
Trachys Fabricius.
25. Prosternal process deeply longitudinally grooved; legs lodged in depressions beneath----- *Brachys* Solier.
 Prosternal process not longitudinally grooved; legs free----- 26.
26. Prosternal process strongly constricted by the anterior coxal cavities; agrilliform----- *Taphrocercus* Solier.
 Prosternal process not constricted by the anterior coxal cavities; form oblong or oval----- *Leiopleura* H. Deyrolle.
27. Femora serrate on inner margin----- *Paradormorphus* Waterhouse.
 Femora not serrate on inner margin----- *Agrilus* Curtis.
28. Eyes parallel----- *Micrasta* Kerremans.
 Eyes feebly oblique, slightly converging behind----- *Mastogenius* Solier.

Genus POLYCESTA Solier

Polycesta SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 281-282, pl. 11, fig. 11.—CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, pp. 1-6, pl. 1.—LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 62-63.—KERREMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 1, 1902, pp. 25-26; Mon. Bupr., vol. 1, 1906, pp. 469-522, pls. 9-10.

Nemaphorus SOLIER, Gay's Hist. Nat. Chile, Zool., vol. 4, 1851, pp. 490-491.

Head flat; epistoma very short, and sinuate or truncate in front; antennal cavities small, rounded, entirely closed in front, and sur-

rounded posteriorly by an elevated carina. Antennae rather long, first joint moderately clavate at apex, second obconical, third elongate and subcylindrical, fourth elongate and feebly clavate, fifth to eleventh more or less serrate and each joint armed with a terminal poriferous fovea, the joints becoming gradually shorter from the fifth to eleventh joint, the latter somewhat rounded at the apex. Eyes moderately large, narrowly elongate, elliptical, feebly convex, and slightly converging above. Pronotum strongly transverse, more or less angulated on the sides; base bisinuate and fitting closely to the elytra; surface often concave or longitudinally sulcate at the middle. Scutellum small and variable in shape. Elytra variable, short or moderately long, the sides usually sinuate in front, attenuate posteriorly, with the sides more or less serrate toward the apex. Sternal cavity formed entirely by the mesosternum, which is deeply emarginate in front, the lateral branches broad and diverging. Prosternum wide, flat or feebly convex, the anterior margin sinuate or feebly lobed on each side. Posterior coxae narrow and feebly dilated internally, the anterior margin transverse and rather strongly sinuate; posterior margin strongly, broadly arcuately emarginate. Abdomen with the suture between the first and second segments sinuate and not parallel with the other segments. Legs moderately long; femora subfusiform and flattened; tibiae cylindrical; tarsi compressed and feebly developed, first joint moderately elongate, second and third triangular and about equal in length, fourth wider, more elongate, and strongly triangular, fifth elongate and obconical; tarsal claws simple. Body robust, oblong, more or less elongate, and attenuate in front and behind.

This genus contains about 30 described species, which are all found in the Neotropical region, with the exception of one species from China and four from Africa. This paper includes 13 species, one of which is described as new, all having been recorded from the West Indies.

The species of the genus resemble each other very closely, and considerable confusion has been caused by the erroneous identifications of some of the older species by various authors. The species are not very well represented in collections, and until more specimens from exact localities are available for study, much doubt must still be attached to the names of several species.

My studies of this genus has been made possible through the kindness of Dr. C. J. Gahan, of the British Museum, in loaning me a series of species, a number of which had been compared with the types of Linnaeus, Thomson, Gory, etc., by the late C. O. Waterhouse.

POLYCESTA CYANIPES (Fabricius)

Buprestis cyanipes FABRICIUS, Mant. Ins., vol. 1, 1787, p. 178

Polycesta cyanipes WATERHOUSE, Ann. and Mag. Nat. Hist., ser. 7, vol. 14, 1904, p. 254.—KERREMANS, Mon. Bupr., vol. 1, 1906, pp. 474-475, pl. 9, fig. 5.

Polycesta resplendens THOMSON, Typ. Bupr., 1878, p. 45.

Polycesta jamaicensis WHITE MSS.

Female.—Oblong, broadly rounded in front, slightly more attenuate posteriorly and feebly convex above; color above green, sometimes the sides and suture aeneo-cupreous, and usually with a strong violaceous tinge when viewed in certain lights; beneath of the same color as above.

Head flat, with an obsolete depression on the front and a feeble, narrow longitudinal groove on the occiput; surface somewhat rugose, coarsely, deeply, and rather densely punctate, the punctures variable in size and irregularly placed, forming irregular, broadly rounded intervals on the front, which are smooth, shining, and glabrous; epistoma truncate or obsoletely arcuately emarginate in front. Pronotum strongly transverse, nearly two times as wide as long, distinctly narrower in front than behind, widest at the middle; sides obliquely arcuately expanded to the middle, where they are broadly rounded to the basal fifth, then parallel to the posterior angles, which are rectangular (in some specimens the sides are obliquely attenuate from the middle to the posterior angles); anterior margin deeply arcuately emarginate, with a distinct, broadly rounded median lobe; base truncate or feebly bisinuate; disk feebly flattened, with a broad obsolete depression extending over the entire median part, the depression very shallow and with a feeble longitudinal median sulcus, which is more deeply impressed on the basal half; surface declivous on the sides toward apical angles and with a narrow groove along the anterior margin, and sometimes with an obsolete one along the base, coarsely, rather densely, but not deeply punctate, the punctures finer and more remotely separated on the disk, but becoming deeper, coarser, and somewhat confluent at the sides, the intervals smooth and glabrous. Scutellum quadrate or oblong, and slightly wider behind than in front. Elytra feebly flattened above, declivous at the sides, and equal in width to the pronotum at base; humeral angles rectangular; sides nearly parallel to the apical third, then arcuately attenuate to the tips, which are conjointly broadly rounded; lateral margins strongly and coarsely serrate near apex; surface without distinct costae, but with punctured striae, which are feebly impressed, with the punctures fine and irregularly placed; intervals smooth, irregular in width, obsoletely rugose posteriorly, and with a few obsolete punctures; sutural margins elevated posteriorly; humeri obsoletely developed. Abdomen beneath coarsely, rather densely,

and irregularly punctate, the punctures variable in size, open posteriorly, and from the middle of each arises a short recumbent hair, the intervals finely and densely granulose; first segment abruptly convex at middle; last segment rather acutely rounded at apex. Prosternum strongly convex, the surface, coarsely and irregularly punctate, sparsely clothed with a few short semi-erect hairs and the intervals finely and obsoletely granulose; anterior margin with a broadly rounded median lobe, which is feebly arcuately emarginate in front; prosternal process short, broad, and with a short marginal groove on each side, the sides nearly parallel to the middle of the anterior coxal cavities, where they are emarginate and abruptly narrowed to near the apex, which is very broadly rounded.

Male.—Not seen.

Length, 17–25 mm.; width, 5.5–8 mm.

This species was originally described by Fabricius from a specimen from South America in the Hunter collection. Thomson (1878) redescribed the same species under the name *resplendens* from a questionable locality, probably Surinam or Brazil. Waterhouse (1904) examined the type of this species in the Hunter collection at the University of Glasgow, and also the type of *resplendens* Thomson in Oberthür's collection, and states that *cyanipes* Fabricius is the same as *resplendens* Thomson from Jamaica.

The following material has been examined. Coll. British Museum: One specimen labeled simply "Parry, Saunders 74–18"; and another example from Bath, Jamaica, which was compared with the type by Waterhouse. Coll. Amer. Mus. Nat. Hist.: One specimen labeled "Jamaica," without any additional data. Coll. U. S. Nat. Mus.: One specimen labeled "Jamaica" (donated by the Amer. Mus. Nat. Hist.).

This beautiful insect is easily separated from all other species of this genus by the elytra not having distinct costae.

POLYCESTA CUBAE Chevrolat

Polycesta cubae CHEVROLAT, Silbermann's Revue Ent., vol. 5, 1838, pp. 55–56.—GORY, Mon. Bupr. Suppl., vol. 4, 1840, pp. 141–142, pl. 24, fig. 139.—JACQUELIN DUVAL, In Ramon de la Sagra's Hist. Phys. Polit. et Nat. de l'île de Cuba, Anim. Artic., 1857 (French Edition), p. 62; (Spanish Edition), vol. 7, 1857, p. 23.—CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 582 (separates, p. 158).—GUNDELRACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, 1891, p. 165, No. 861.—KERREMANS, Mon. Bupr., vol. 1, 1906, pp. 500–501.

Male.—Elongate, broadly rounded in front, more acuminate behind, and feebly convex above; above uniformly dark aeneo-cupreous, with the bottom of the punctures more reddish-cupreous and in fresh specimens usually filled with a whitish pulverulence; beneath cupreous with a slight purplish tinge and more shining than above.

Head nearly flat, without any depressions on the front, but with an irregular longitudinal carina on the occiput; surface very coarsely, irregularly and densely punctate, the punctures variable in size, coarse and irregular in form on the front, but becoming smaller and more rounded at the sides and on the occiput, sparsely clothed with rather long erect hairs, the intervals irregular in shape, convex on top, smooth and shining, except on the epistoma where they are granulose and subopaque; epistoma obsoletely arcuately emarginate in front. Pronotum strongly transverse, two times as wide as long, only slightly narrower in front than behind, and widest just behind the middle; sides obliquely expanded from the apical angles to just behind the middle, where they are broadly rounded, then more obliquely attenuate to the posterior angles, which are rather acute and covered by the elytra; anterior margin deeply arcuately emarginate, with a broadly rounded median lobe; base bisinuate with the median lobe strongly angulated; disk with a feeble median depression, which is more deeply impressed near the scutellum, and in some specimens feebly longitudinally grooved; surface coarsely and deeply punctate, the punctures denser here and there, and becoming coarse and confluent on the sides, more remotely placed on the disk, where there are two large triangular opaque spaces, which are very sparsely punctate, and separated from each other by the median depression, the surface sparsely clothed with a few very short, inconspicuous hairs. Scutellum small, oblong, slightly wider behind than in front, and strongly convex. Elytra feebly convex, slightly wider than pronotum at base; humeral angles obtusely angulated; sides feebly expanded behind the humeral angles, slightly sinuate at the posterior coxae, nearly parallel to apical third, then arcuately attenuate to the tips, which are conjointly, rather acutely rounded, the lateral margins coarsely and irregularly serrate posteriorly; each elytron with three slightly elevated costae, the scutellar one extending to the basal fourth, and two similar ones on the disk, distinctly marked on the basal region, but becoming obsolete toward the apex, the intercostae nearly as prominent as the costae, irregular in shape, strongly interrupted by the punctures toward the sides, the tops with numerous punctures which are shallow but nearly as wide as the costae, the punctures between the costae, very coarse, deep, irregular in size and shape, and more or less confluent; humeri feebly developed. Abdomen beneath coarsely, densely punctate, and rather densely clothed with moderately long recumbent hairs, the intervals obsoletely granulose; first segment rather abruptly convex, with a densely punctured and pubescent spot at the middle; last segment rather acutely rounded at apex. Prosternum moderately convex, transversely concave at middle, the

surface coarsely, rather densely and irregularly punctate, sparsely clothed with short inconspicuous hairs, and the intervals smooth and shining; anterior margin with a broad median lobe, which is broadly arcuately emarginate in front; prosternal process short, broad, flat and without marginal grooves, the sides nearly parallel to middle of anterior coxal cavities, where they are emarginate and abruptly narrowed toward the apex, which is very broadly rounded.

Female.—Differs from the male in being larger and more robust, the abdomen beneath more sparsely punctured and less pubescent, and the first abdominal segment feebly convex and smooth at the middle.

Length, 15–22 mm.; width, 5.5–7.5 mm.

This species was described by Chevrolat (1838) from Cuba, and its distribution is probably restricted to that island. Jacquelin Duval (1857) simply records it from Cuba, and Chevrolat (1867) states that it is found in the eastern and central part of the island, and that specimens are in the collections of Gundlach, Poey, and Chevrolat. Gundlach (1891) records it from the eastern part of the island.

The following material has been examined: Coll. British Mus.: One male labeled "Cuba (Coll. Chevrolat)" and marked type. Coll. Amer. Mus. Nat. Hist.: Male and female collected on the San Carlos Estate, Guantanamo, Cuba, June 18, 1916, by Chas. T. Ramsden. Coll. Acad. Nat. Sci. Philad.: One female labeled Cuba (Poey Coll. No. 339). Coll. U. S. Nat. Mus.: Male and female collected on the San Carlos Estate, Guantanamo, Cuba, June 18, 1916, by Chas. T. Ramsden. (Donated by the Amer. Mus. Nat. Hist.) There is also a single specimen of this species labeled No. 861 in the Gundlach Collection in Havana which has not been examined by the writer.

This species is easily separated from the other species of this genus found in the West Indies by the two subopaque spots on the pronotum.

POLYCESTA GORYI Saunders

Polycesta depressa CASTELNAU and GORY (not Linnaeus), Mon. Bupr., vol. 2, 1837, p. 3, pl. 1, fig. 2. (Name preoccupied.)

Polycesta goryi SAUNDERS, Catal. Bupr., 1871, p. 58.—KERREMANS, Mon. Bupr., vol. 1, 1906 pp. 481–483.

Polycesta solieri THOMSON, Typ. Bupr., 1878, p. 44.

Polycesta cribrata THOMSON, Typ. Bupr., 1878, pp. 44–45.

Polycesta velasco WICKHAM (not Castelnau and Gory), Canad. Ent., vol. 27, 1895, p. 294.

Male.—Rather broad, short, moderately convex and broadly rounded in front and behind; uniformly black above and beneath, in some specimens the underside with a feeble brownish tinge.

Head flat or feebly convex, without any depressions on the front, but with a transverse depression between the antennal cavities;

occiput not longitudinally carinate; surface coarsely, deeply and densely punctate, the punctures nearly confluent, smaller toward the sides and forming numerous smooth, vermiculate reliefs, sparsely clothed with rather long, fine, erect hairs; epistoma truncate in front. Pronotum strongly transverse, nearly two times as wide as long, distinctly narrower in front than behind, widest at basal third; sides strongly obliquely expanded from apical angles to basal third where they are obtusely angulated, then obliquely attenuate to near the posterior angles, which terminate into an acute angle and projecting beneath the base of the elytra; anterior margin arcuately emarginate, with a feebly angulated median lobe; base rather strongly bisinuate, with the median lobe broadly angulated in front of the scutellum; disk feebly flattened, with a broad, shallow, triangular depression at the middle, and sometimes with an obsolete longitudinal median carina, the sides are broadly declivous toward the apical angles and more narrowly so along the base toward the posterior angles; surface coarsely, deeply and densely punctate, the punctures irregular in size, irregularly placed, distinctly on the disk but becoming more confluent on the antero-lateral areas, the intervals subopaque and obsoletely granulose, there is also a very short erect obsolete hair in the middle of the punctures. Scutellum very small, subquadrate, wider behind than in front, strongly convex and shining. Elytra feebly convex, slightly wider than pronotum at base; humeral angles broadly rounded; sides feebly expanded behind the humeral angles, slightly sinuate at the posterior coxae, nearly parallel to the apical third, then broadly arcuately attenuate to the tips, which are conjointly broadly rounded, the lateral margins coarsely serrate posteriorly; each elytron with a distinct scutellar costa extending to about the basal fourth, and four other strongly elevated costae, first and second costae more distinct, enlarged anteriorly and joined to the base, the third beginning behind the humeral callosity, and the fourth parallel to the lateral margin and separated from it by a row of large, irregular transverse punctures, the costae separated from each other by two rows of large, deep punctures, which are more or less confluent, and with the intercostae not elevated, the costae and intercostae with a few remotely placed punctures and the sutural and lateral margins rather densely punctate; humeri feebly developed. Abdomen beneath rather finely and densely punctate, and sparsely clothed with moderately long pale recumbent hairs; first segment convex at middle and with a densely punctured and pubescent median spot; last segment declivous toward the apex, which is obtusely angulated. Prosternum strongly convex, surface coarsely densely punctate, rather densely clothed with long fine erect hairs, and the intervals obsoletely granulose; anterior margin nearly truncate, in some specimens with an obsolete lobe on each side;

prosternal process short, broad, feebly convex, and without marginal grooves, the sides nearly parallel to the middle of the anterior coxal cavities, where they are emarginate and abruptly narrowed to near the apex, which is very broadly rounded.

Female.—Differs from the male in having the first abdominal segment feebly convex and without the densely punctured and pubescent median spot.

Length, 16 mm.; width, 7 mm.

This species was described by Castelnau and Gory (1837) from Cayenne, Guiana, as *depressa*, but since this name had been used previously by Linnaeus for a species of this genus from South America, Saunders (1871) proposed the new name *goryi*. The species has also been described by Thomson (1878) from Colombia as *solieri*, and the second time in the same paper from Caracas, Venezuela under the name of *cribrata*. Waterhouse has examined the types of *solieri* and *cribrata* in the Oberthur collection and finds that they are identical with the species described by Castelnau and Gory as *depressa*, and later changed by Saunders to *goryi*. This is the species recorded by Prof. H. F. Wickham (1895) from the Bahamas as probably *velasco* Castelnau and Gory.

The above description was made from a male specimen from Venezuela, kindly loaned by the British Museum, and which was compared with the type of *cribrata* by Waterhouse, and with which it agrees. Leng and Mutchler in their List of the West Indian Coleoptera¹² record it from the Antilles, and there is a single male specimen in the Coll. U. S. Nat. Mus., received from H. F. Wickham, labeled "Water Cay, Bahamas" which does not differ from the specimen from which the above description was made. In the Coll. Acad. Nat. Sci. Philad., there is a single female labeled "Cuba (Poey Coll. No. 347)" which is slightly narrower than the other specimens examined.

This is one of the shortest oblong species found in the West Indies. It is entirely black above, equally rounded in front and behind, and each elytron with five distinct costae, including the scutellar one.

POLYCESTA REGULARIS Waterhouse

Polycesta regularis WATERHOUSE, Ann. and Mag. Nat. Hist., ser. 7, vol. 14, 1904, pp. 256-257.—KERREMANS, Mon. Bupr., vol. 1, 1906, pp. 487-488.

The following is a copy of Waterhouse's original description:

Oblong, parallel, much flattened, only a little more than twice as long as broad, nearly black, but with a slight cyaneous tint below. Elytra ferrugi-

¹² Bull. Amer. Mus. Nat. Hist., vol. 33, 1914, p. 429.

nous. Thorax not quite twice as broad as long, black, dull, broadest behind the middle, strongly angular at the sides, obliquely narrowed in front and behind; the space from the lateral angle to the base rectilinear. The punctuation strong and sharp; the punctures in the discoidal impression (which is very shallow and ill defined) moderately large and very slightly separated, at the sides they are smaller and crowded together. There are two small spaces at the base which have only a few punctures. The elytra are rusty brown, the margin and costae blackish. There are four smooth costae, the first abbreviated before the middle, the second and third well marked, the fourth fine and abbreviated at the base and apex. The double lines of foveae between the suture and second costa and the second and third costae are regular and the foveae are subquadrate. The foveae which form the more lateral lines are regular, but a little less quadrate. Viewed beneath, the lateral ridge of the thorax is very sharp. The whole under side is clothed with a fine, grey pubescence. The abdomen is very distinctly and rather closely punctured. There is an oval, brown, pubescent spot on the basal segment. Long. 14 mm. *Hab.* St. Domingo (or possibly Dominica).

This species is very close to *P. Chevrolati*, but is smaller, and the lines of punctures on the elytra are very regular.

A single specimen from an old collection, with the locality indistinctly written.

The type of this species is in the British Museum, and since I have been unable to examine it, the species is given its position in the key solely from the characters given in the original description.

POLYCESTA CHEVROLATI Thomson

Polycesta chevrolatii THOMSON, Typ. Bupr., 1878, pp. 43.—KERREMANN, Mon. Bupr., vol. 1, 1906, pp. 488-489.

The following is a translation of Thomson's original description:

Polycesta chevrolatii (Guérin Mss.) Thomson.—Habitat: Cuba. Length, 21-26 mm.; width, $8\frac{1}{2}$ -11 mm. Form of *P. thomae* Chevrolat, but entirely black. Head granulate-punctate. Prothorax with the sides strongly dilated behind the middle, feebly depressed at middle, with a feeble longitudinal line at the base; surface punctate, the punctures coarse and densely placed at the middle and sides. Elytra carinate-fossulate, the fossae densely placed and generally subelongate; sides toward the apex denticulate, with apex bispinose. Body beneath and legs sparsely punctate.

Allied to *P. thomae* Chevrolat, but differs from it: first by the general appearance (livrée); second, by the prothorax being straight anteriorly and not as strongly punctured; third, by the fossae on the elytra generally elongate, and finally by the underside less densely punctured.

There is a single specimen of this species in the British Museum, but it has not been examined by the writer. The species was unknown to Kerremans, as he simply quoted Thomson's description in his *Monographie des Buprestides*.

POLYCESTA PERFECTA Kerremans

Polycesta perfecta KERREMANS, Mon. Bupr., vol. 7, 1914, pp. 257-258.

The following is a translation of Kerreman's original description: Length, 24 mm.; width, 9 mm. Elongate, attenuate behind, slightly convex, entirely black above, with a very feeble purple reflection on the elytra, turning to blue along the suture; beneath black with a slight bronzy tinge, pubescence of a dull reddish color, with the tibiae and tarsi bluish. Remarkable for the regularity and distinctness of the elytral structure. Head rugous, with irregular vermiculate reliefs. Pronotum wider than long, narrower in the front than behind, widest behind the middle; anterior margin truncate; sides strongly obliquely converging to the front, rounded just behind the middle, then sinuate and less converging to the base, with the posterior angles small, feebly projecting externally and feebly depressed on the humeral angles of the elytra; base bisinuate; middle of disk depressed; surface covered with round punctures, rather closely and unequally spaced, more unequal and irregular near the anterior angles, where the intervals form a network of irregular areas. Scutellum small, wider than long. Elytra feebly lobed and transversely impressed at the base, nearly parallel on the sides to the posterior third, then regularly arcuately attenuate to the tip, which is armed with teeth, unequal in length, and densely and irregularly placed between the suture and the sixth row of punctures; surface covered with rows of coarse, transverse, subrectangular punctures arranged in very regular double rows, and separated by smooth, feebly costiform lines. Beneath finely and unequally punctate, the punctures much finer and denser along the external margins of the abdominal segments; legs slightly robust, femur nearly smooth, the punctures fine and widely separated, tibiae a little more coarsely and densely punctured. Habitat: Jamaica (Kerreman's Collection).

No specimens have been seen by the writer which would agree with the above description, so the species has been placed in the key solely upon the characters given in the original description.

POLYCESTA GOSSEI Waterhouse

Polycesta gossei WATERHOUSE, Ann. and Mag. Nat. Hist., ser. 7, vol. 14 1904, pp. 257-258.—KERREMANS, Mon. Bupr., vol. 1, 1906, p. 499.

The following is a copy of Waterhouse's original description:

Elongate-oblong, much flattened; green; elytra ferruginous, shaded with green at the suture. Thorax at the widest scarcely wider than the elytra, only slightly angular at the sides, obliquely narrowed in front, very slightly narrowed posteriorly; green, shaded with purple-coppery at the base. Disk lightly impressed; the punctures rather coarse, very close, and rather confused, rather smaller at the sides, with two spots at the base which have only a few punctures. Elytra subparallel, with a not very distinct costa near the scutellum extending about a quarter the length of the elytra. There are two other very distinct smooth costae. The foveae which form the double lines are very regular and somewhat round. Beyond the second complete costa there are four rows of regular somewhat round foveae or large punctures. The underside is a

beautiful bluish green, the legs, parts of the sterna, and margins of the segments shaded with purple. Tarsi cyaneous. The abdomen has some fine greyish pubescence, and on the basal segment there is a brown velvety spot. Long. 11 mm. Habitat: Jamaica (Gosse).

This species is very near *P. velasco* Laporte and Gory, but that has a rather more angulated thorax, etc. It is possible that *velasco* and *montezuma* Laporte and Gory, may be sexes of the same species, but there is not material at hand to enable me to decide.

The type of this species is in the collection of the British Museum and has not been examined by the writer, but is included in the key from the characters given in the original description.

POLYCESTA MANNI, new species

Female.—Narrowly elongate, subsylindrical, broadly rounded in front, more attenuate behind, and moderately convex above; head and pronotum black with the bottom of the punctures and median depression on pronotum more or less cupreous; scutellum black; elytra ferrugineous with the suture narrowly margined with a nigro-aeous color; beneath nigro-aeous with a slight greenish or purplish tinge, and the tarsi cyaneous.

Head slightly convex without depressions on the front; surface coarsely and densely punctate, the punctures not very deep, irregularly placed, becoming somewhat confluent toward the sides and forming a network of irregular shaped reliefs, also sparsely clothed with long inconspicuous erect, cinereous hairs; epistoma truncate in front; antennae rather long, and reaching to the basal third of the pronotum. Pronotum strongly transverse, two times as wide as long, narrower in front than behind, widest just behind the middle; sides regularly arcuately rounded, more obliquely in front than behind, the posterior angles obtusely rounded and rather widely separated from the elytra; anterior margin feebly arcuately emarginate and without a median lobe; base obliquely truncate to near the middle, where it is strongly angularly lobed and transversely truncate in front of the scutellum; surface with a large, deep oblong median depression, which is longitudinally carinate at the middle, and with an obsolete depression on each side in the antero-lateral areas, the surface in the median depression is finely and densely punctate, the punctures shallow, more or less confluent, and shining at the bottom, on each side of the depression the surface is subopaque with deep pit like punctures, which are irregularly placed and rather widely separated, and on the antero-lateral regions the punctures become confluent, forming a network of vermiculate reliefs, which are more or less shining, in the center of each puncture is a small round elevation from which arises a rather long fine semi-erect hair. Scutellum

nearly square, flat, and broadly rounded behind. Elytra feebly convex, about as wide as the pronotum at base; humeral angles broadly rounded; base strongly angulated; sides slightly arcuately expanded behind the humeral angles, rather strongly sinuate at the posterior coxae, nearly parallel to the apical third, then arcuately attenuate to the tips, which are rather acutely rounded, lateral margins coarsely dentate posteriorly, the teeth irregularly placed and very variable in size; humeri feebly developed; each elytron with 10 longitudinal rows of deep round punctures, which are about equal distance from each other and separated by narrow longitudinal costae, of which the second and fourth are more distinct and strongly elevated than the others, there is also an additional row of punctures extending from the base to near the middle, and separated from the sutural row by a short scutellar costa, which is as strongly elevated as the second and fourth costae, the costae with numerous large, round, shallow punctures, which are irregularly placed toward the side of the costae, becoming more numerous toward the sides and at the apical region, and in the center of which is a minute round elevation bearing an obsolete hair. Abdomen beneath sparsely and rather coarsely punctate, becoming feebly scabrous at the sides of basal segments, and clothed with moderately long, recumbent cinereous pubescence, the hairs sparsely placed on median parts but becoming much denser at the sides, the intervals nearly smooth, and moderately shining; first segment moderately convex and without a densely punctured and pubescent median spot; last segment rather narrowly rounded at apex. Prosternum moderately convex, the surface sparsely, coarsely punctate, and sparsely clothed with long fine erect hairs; anterior margin broadly rounded, with a feeble, arcuate emargination at the middle, on each side of which the margin is rather strongly elevated; prosternal process short, very broad, feebly convex, with distinct marginal grooves and with the lateral margins narrowly flattened and granulose, the sides parallel to the posterior part of the anterior coxal cavities, where they are transversely narrowed, with the apex broadly rounded.

Length, 17 mm.; width, 5.75 mm.

Type locality.—Mangrove Cay, Andros Island, Bahamas.

Type.—Coll. Amer. Mus. Nat. Hist.

This species is described from a single female collected at the type locality during May or June, 1917, by William M. Mann.

It is one of the most slender species of the genus and can be readily separated from all other *Polycesta* found in the West Indies by the coloration, and by the posterior angles of the pronotum being broadly rounded and not fitting closely to the base of the elytra.

POLYCESTA PORCATA (Fabricius)

Buprestis porcata FABRICIUS, Syst. Ent., 1775, p. 219.

Polycesta porcata MANNERHEIM, Bull. Soc. Imp. Nat. Moscou, vol. 10, no. 8, 1837, p. 86.—CHEVROLAT, Silbermann's Revue Ent., vol. 5, 1838, p. 56.—WATERHOUSE, Ann. and Mag. Nat. Hist., ser. 7, vol. 14, 1904, p. 254.—KERREMANS, Mon. Bupr., vol. 1, 1906, pp. 516-518.

Male.—Broadly elongate, averaging about two and one-fifth times as long as wide; broadly rounded in front, more narrowly rounded behind, and feebly convex above; color above aeneo-nigris, with a strong greenish and purplish tinge; beneath of the same color but more shining than above.

Head flat without any depressions on the front, but with a short obsolete longitudinal carina on the occiput; surface coarsely, deeply and densely punctate, the punctures variable in size, irregularly placed, and separated from each other by less than their diameter, clothed with a few very fine erect hairs, the intervals irregular in shape, convex, smooth and shining on the top; epistoma feebly arcuately emarginate in front. Pronotum strongly transverse, two times as wide as long, distinctly narrower in front than behind, and widest at basal third; sides strongly obliquely expanded from the apical angles to basal third, where they are obtusely angulated, then strongly narrowed to near the posterior angles, which are nearly rectangular; anterior margin deeply arcuately emarginate, with a broadly rounded median lobe, and the margin smooth and narrowly elevated; base bisinuate, with the median lobe rather strongly angulated; disk with a broad shallow median depression; surface coarsely, deeply, and densely punctate, the punctures more or less confluent in the median depression and toward the antero-lateral areas, glabrous, the intervals densely granulose and subopaque. Scutellum small, suboval, slightly wider behind than in front, and strongly convex. Elytra feebly convex, about as wide as the pronotum at base; humeral angles obtusely angulated; sides feebly expanded behind the humeral angle, slightly sinuate at the posterior coxae, nearly parallel to apical third, then arcuately attenuate to the tips, which are rather acute; the lateral margins coarsely and irregularly serrate posteriorly; each elytron with four feebly elevated smooth longitudinal costae, not including the scutellar one, which is very short and not extending to the base, the costae irregular, sinuate and usually only the two discal ones distinctly marked on the basal regions, becoming more obsolete toward the apex, there are also nine or ten longitudinal rows of large deep elliptical punctures, which are arranged in double rows between the costae, the punctures more or less confluent, very variable in shape and size, and forming a network of alveolus areas, the sutural and lateral margins coarsely and densely punctate;

humeral feebly developed. Abdomen beneath coarsely and rather densely punctate, and sparsely clothed with very fine, short recumbent hairs, the intervals smooth and shining; first segment strongly convex at middle, with a densely punctured median spot, which is densely clothed with short, semi-erect, scale like hairs; last segment rather broadly rounded at apex. Prosternum strongly convex, surface sparsely punctate, the punctures fine on the median part but becoming very coarse and more or less confluent at the sides, sparsely clothed with a few obsolete semi-erect hairs; anterior margin feebly elevated, feebly but broadly emarginate in front, forming an obsolete lobe on each side; prosternal process short, broad, feebly convex, and without marginal grooves, the sides obliquely narrowed to middle of anterior coxal cavities, where they are emarginate and abruptly narrowed, the apex very broadly rounded.

Female.—Differs from the male in being larger and more robust, and the first abdominal segment feebly convex and without the densely punctured and pubescent median spot.

Length, 18–25 mm.; width, 7–10.5 mm.

Originally described by Fabricius (1775) from "Oriente." Mannerheim (1837) and Chevrolat (1838) both record it from the island of St. Domingo, and Waterhouse (1904) states that it is apparently common in St. Domingo.

The following material has been examined. Coll. British Mus.: One male and two females, labeled as follows: St. Domingo (Fairmaire); St. Domingo (Coll. Chevrolat); and St. Domingo (Saunders 74–18). Coll. U. S. Nat. Mus.: One female, labeled "Antilles (Fairmaire)" (donated by the British Museum).

This is one of the broadest species of the genus.

POLYCESTA ANGULOSA Jacquelin Duval

Polycesta angulosa JACQUELIN DUVAL, in Ramon de la Sagra's Hist. Phys. Polit. et Nat. de l'île de Cuba, Anim. Artic., 1857 (French edition), pp. 62–64; (Spanish edition) vol. 7, 1857, p. 28.—CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, pp. 582–583 (separates pp. 158–159).—GUNDLACH, Contribucion à la Entom. Cuba, vol. 3, pt. 5, 1891, p. 106, no. 807.

Polycesta excavata KERREMANS, Mon. Bupr., vol. 1, 1906, pp. 513–515 (part).

Female.—More narrowly elongate than *porcata*, averaging about two and two-third times as long as wide, broadly rounded in front, more acuminate behind, and feebly convex above; color above black or greenish-black, sometimes more or less cupreous, with the bottom of the punctures more distinctly cupreous than the reliefs; beneath dark aeneous to cupreous, with a strong greenish, bluish, or purplish tinge when viewed in certain lights.

Head nearly flat, with an obsolete depression on the front, and a short longitudinal carina on the occiput; surface coarsely and very densely punctate, the punctures variable in size and shape, more or less confluent and from the center of each arises a moderately long, fine erect hair, the intervals irregular in shape, with the tops sharply defined; epistoma truncate or obsoletely emarginate in front. Pronotum strongly transverse, not quite two times as wide as long, distinctly narrower in front than behind, and widest just behind the middle; sides obliquely expanded from the apical angles to just behind the middle, where they are obtusely rounded or angulated, then obliquely narrowed to near the posterior angles where they are more parallel, the angles obtuse and slightly projecting beneath the elytra; anterior margin feebly arcuately emarginate, with only an obsolete median lobe; base bisinuate with the median lobe broadly angulated; disk with a broad shallow median depression, which is more or less longitudinally carinate at middle; surface coarsely, densely, and deeply punctate, the punctures much denser and somewhat confluent in the median depression and at the sides, where they are more irregular in shape, and the intervals forming a network of irregular alveolus areas, sparsely clothed with a few short inconspicuous hairs. Scutellum small and subquadrate. Elytra feebly convex, about as wide as pronotum at base; humeral angles obtusely angulated; sides slightly expanded behind the humeral angles, feebly sinuate at posterior coxae, nearly parallel to the apical third, then arcuately attenuate to the tips, which are conjointly broadly rounded, the lateral margins coarsely, irregularly serrate posteriorly; each elytron with a feebly indicated scutellar costa, and with two discal costae, which are smooth, straight, and more distinct toward the base, the costae not more strongly elevated than the intercostae, and separated from each other and the suture by double rows of large deep rounded punctures, which are variable in size, and more or less confluent, laterally the costae are obscure, irregular, and interrupted by the punctures, which are very deep, variable in shape and size, and forming a network of alveolus areas, the suture, lateral margin, and tops of reliefs with a few coarse, shallow punctures; humeri feebly developed. Abdomen beneath finely and densely punctate, and clothed with short recumbent hairs, the pubescence rather sparse on the median parts but becoming denser toward the sides, the intervals smooth and shining; first segment feebly convex and without a densely pubescent median spot; last segment rather narrowly rounded at apex. Prosternum strongly convex, surface densely punctate, the punctures rather fine and more widely separated on the prosternal

process, but becoming coarser, denser, and somewhat confluent at the sides and along the anterior margin, sparsely clothed with fine erect hairs; anterior margin broadly but not deeply arcuately emarginate in front, with the margin strongly elevated; prosternal process short, moderately broad, feebly convex, and without marginal grooves, the sides nearly parallel to the middle of the anterior coxal cavities, where they are emarginate and abruptly narrowed, the apex broadly rounded.

Length, 18-21 mm.; width, 7-8 mm.

Described by Jacquelin Duval (1857) from Cuba. Chevrolat (1867) records it from the central part of the same island from material in the collections of Gundlach, Poey, and Chevrolat. Gundlach (1891) records collecting specimens at Cienfuegos, and also at Caimanera near Guantanamo, both localities in Cuba.

Material has been examined of this species as follows. Coll. British Mus.: Two females, one labeled "Cuba (Poey)" and marked type, the other simply labeled "Parry (Saunders 74-18)." Coll. Acad. at. Sci. Philad.: One female, Cuba (Poey Coll.). Coll. Amer. Mus. Nat. Hist.: One female, Guantanamo, Cuba, collected June 11, 1910, by Chas. T. Ramsden. Coll. U. S. Nat. Mus.: One female, Guantanamo, Cuba, collected June 26, 1915, by Chas. T. Ramsden. (Donated by Amer. Mus. Nat. Hist.) There is also a specimen in the collection of the Acad. Nat. Sci. Philad., labeled "Cuba (Poey Coll.);" which I have placed under this species. It is a very small specimen measuring only 11 millimeters in length and 4.5 millimeters in width, and which agrees in every way with the other specimens of this species examined, except in size. It is a male and has the usual densely punctured and pubescent median spot on the first abdominal segment. There is a single example labeled No. 807 in the Gundlach Museum in Havana which has not been examined by the writer.

Kerremans has placed this species as a synonym of *excavata* described by Blanchard (1846) from Argentine Republic, but since these localities are so widely separated and the species has not been reported from any intermediate localities, I am retaining the name *angulosa* for the specimens collected in Cuba. This species is closely allied to *porcata* Fabricius, but it is more slender, head more densely and coarsely punctured, anterior margin of pronotum not as deeply emarginate, abdomen beneath more finely punctured and more densely pubescent, prosternum more densely punctured, and the prosternal process much narrower in proportion to its length than in *porcata*.

POLYCESTA OLIVIERI Waterhouse

Buprestis depressa OLIVIER (not Linnaeus), Entomol., vol. 2, gen. 32, 1790, pp. 39-40 (part), (name preoccupied).

Polycesta olivieri WATERHOUSE, Ann. and Mag. Nat. Hist., ser. 7, vol. 14, 1904, p. 255.—KERREMANS, Mon. Bupr., vol. 1, 1906, pp. 511-513.

Female.—Elongate, broadly rounded in front, more attenuate behind, feebly flattened above and similar in shape to *angulosa* Jacquelin Duval; above dull brownish-cupreous, with an obscure greenish or purplish tinge; beneath aeneous, with a strong purplish or greenish reflection, the tibiae, tarsi and antennae bluish-green.

Head flat without any depressions on the front, but with a short obsolete longitudinal carina on the occiput; surface coarsely, deeply and densely punctate, the punctures very irregularly placed and more or less confluent, sparsely clothed with very fine erect inconspicuous hairs, the intervals very irregular in shape, smooth and convex on the top; epistoma truncate or obsoletely emarginate in front and feebly lobed on each side at the antennal cavities. Pronotum strongly transverse, two times as wide as long, narrower in front than behind, and widest just behind the middle; sides strongly obliquely expanded to just behind the middle, where they are broadly rounded, then strongly attenuate to near the posterior angles where they are nearly parallel for a short distance (in one of the specimens the sides are regularly arcuately rounded), the posterior angles acute and slightly projecting beneath the elytra; anterior margin feebly arcuately emarginate, without a median lobe; base feebly bisinuate or nearly transversely truncate; disk broadly but very feebly depressed; surface coarsely, deeply, and rather densely punctate, the punctures irregularly placed, much coarser and denser in the median depression and on the antero-lateral regions, where they are also more or less confluent, sparsely clothed with short inconspicuous hairs, and with the intervals subopaque. Scutellum subquadrate (in one specimen it is wider than long). Elytra feebly flattened on disk, declivous on the sides and about as wide as the pronotum at base; humeral angles obtusely angulated; sides obsoletely expanded behind the humeral angles, feebly sinuate at the posterior coxae, nearly parallel to the apical third, then arcuately attenuate to the tips, which are acutely rounded, the lateral margins strongly and irregularly serrate posteriorly; each elytron with 10 entire longitudinal rows of deep, round or subquadrate punctures, which are about equal distance from each other, and separated by narrow longitudinal costae, of which the second and fourth are more distinctly elevated than the others, there is also an additional row of finer punctures along the suture extending from the scutellum to basal fourth, and not separated

from the other rows of punctures by a costa; humeri obsolete. Abdomen beneath finely and densely punctuate, the punctures sparser on the median parts, but becoming much denser toward the sides, and rather densely clothed with short recumbent hairs, the intervals smooth and subopaque; first segment moderately convex, and without a densely punctated and pubescent spot at middle; last segment rather acutely rounded at apex. Prosternum strongly convex, surface finely, sparsely punctate, and sparsely clothed with long, very fine, erect hairs; anterior margin broadly rounded in front, with a broadly arcuate emargination at the middle; prosternal process short, moderately broad and with feeble marginal grooves, the sides nearly parallel to the middle of anterior coxal cavities, where they are emarginate and abruptly narrowed, the apex broadly rounded.

Male.—Not seen.

Length, 20–24 mm.; width, 6.5–8 mm.

Olivier (1790) had before him more than one species when he re-described *Buprestis depressa* Linnaeus, but his figure is certainly that of *depressa* and he records specimens from South America, Antilles and Cayenne in the British Museum. Waterhouse (1904) states that the species described by Olivier as *depressa* is not the one described by Linnaeus under that name, so he proposes the new name *olivieri* for it, and states that there is in the British Museum a very old specimen bearing the name *depressa* which he believed is certainly the one mentioned by Olivier. At least some of the specimens which Olivier had before him were the true *depressa* as his figure and description applies to that species and not to the one which Waterhouse has given a new name. Waterhouse further states that the old specimens in the British Museum are without locality, but recent examples in the Museum and in Oberthür's Collection are from Jamaica.

I have been able to examine two females from the British Museum Collection, labeled simply Jamaica, and from which the above description was made. (One of these specimens has been donated to the United States National Museum collection.)

This species resembles *angulosa* Jacquelin Duval, but it is more flattened above, without scutellar costae, and the elytral punctures are much finer. From *depressa* Linnaeus and *thomae* Chevrolat, which also have the scutellar costae absent, it can be separated by the longitudinal costae on elytra not as distinctly elevated and the punctuation much finer.

POLYCESTA DEPRESSA (Linnaeus)

Buprestis depressa LINNAEUS, Mant Plant., vol. 2, 1771, p. 533.—OLIVIER, Entomol. vol. 2, gen. 32, 1790, pp. 39-40 (part).

Buprestis porcata HERBST, (not Fabricius) Nat. Syst. Ins. Käfer, vol. 9, 1801, pp. 34-35, pl. 145, fig. 6.

Polycesta porcata CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, pp. 2-3, pl. 1, fig. 1.

Polycesta karakera CHEVROLAT, Silbermann's Rev. Ent., vol. 5, 1838, pp. 54-55.—FLEUTIAUX and SAILLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, 1890, p. 404 (separates p. 54).

Polycesta depressa KERREMANS, Mon. Bupr., vol. 1, 1906, pp. 502-506, pl. 10, fig. 2.

Female.—Elongate, broadly rounded in front, more acuminate behind, feebly convex above and similar in shape to *angulosa* Jacquelin Duval; above dark metallic-green with the bottom of the punctures cupreous or purplish, and the entire surface more or less tinged with the same color when viewed in certain lights; beneath brilliant green, with strong cupreous and purplish reflections, the tibiae, tarsi and antennae cyaneous.

Head nearly flat without any depressions on the front, but with an obsolete longitudinal carina on the occiput; surface nearly glabrous, coarsely, deeply and rather densely punctuate, the punctures irregularly placed and widely separated on the median part, but becoming denser and more regularly placed along the eyes, the intervals irregular in shape, smooth and convex on the top; epistoma broadly, but not deeply arcuately emarginate in front. Pronotum strongly transverse, two times as wide as long, distinctly narrower in front than behind, and widest just behind the middle; sides strongly obliquely expanded from the apical angles to just behind the middle, where they are strongly obtusely angulated, then more feebly obliquely attenuate to the posterior angles, which are obtusely angulated and projecting beneath the elytra; anterior margin feebly arcuately emarginate, with a broad obsolete median lobe; base bisnuate, with a broad strongly angulated median lobe; disk with a broad subtriangular median depression, which is not deeply depressed, but sometimes with a fine longitudinal carina at the middle; surface very coarsely and deeply punctuate, the punctures variable in size, becoming confluent in the median depression and on the antero-lateral areas, but more widely separated on each side of the discal depression, the intervals subopaque. Scutellum subquadrate, wider behind than in front, and feebly convex. Elytra feebly convex, slightly wider than pronotum at base; humeral angles obtusely angulated; sides slightly arcuately expanded behind the humeral angles, feebly sinuate at posterior coxae, nearly parallel to apical third, then arcuately attenuate to the tips, which are conjointly narrowly

rounded, the lateral margins strongly and very irregularly serrate posteriorly; each elytron with four strongly elevated longitudinal costae, of which the first and second are more distinct and extending from the base to apex, the third more or less arcuate and extending around the humeral callosity, and the fourth more or less parallel with the lateral margin, uniting with the third at humeral callosity and extending to the margin near apex, the scutellar costa entirely absent; there are also nine or ten longitudinal rows of large, deep round punctures, which are arranged in double rows between the costae, the punctures more or less confluent, irregularly placed and forming a network of alveolus areas, the lateral margin coarsely and rather densely punctured; humeri feebly developed. Abdomen beneath finely and rather densely punctate, rather densely clothed with fine short recumbent hairs, which are shorter and sparser on the median part, but becoming denser toward the sides, the intervals smooth and shining; first segment moderately convex and without a densely punctured and pubescent spot at middle; last segment rather acutely rounded at apex. Prosternum moderately convex; surface coarsely, sparsely punctate, and sparsely clothed with a few fine inconspicuous hairs, anterior margin broadly obsoletely emarginate in front; prosternal process short, moderately broad, and with feeble marginal grooves, the sides nearly parallel to middle of anterior coxal cavities, where they are emarginate and abruptly narrowed, the apex rather broadly rounded.

Male.—Not seen.

Length, 18–24 mm.; width, 7–8.5 mm.

This species was originally described by Linnaeus (1771) from "Oriente." Olivier (1790) gives a figure of this species and records it from South America, Antilles and Cayenne, and states that specimens are in the British Museum. It is the species listed and figured by Herbst (1801) as *porcata* from Cayenne, Guiana, and the Antilles, and also by Castelnau and Gory (1837) under the same name from Guadeloupe. Chevrolat (1838) described this species as *karalcera* from specimens collected at Pointe-à-Pitre, Guadeloupe, by Doctor Lherminier, and which he says is the same species figured by Castelnau and Gory as *porcata*, but is not the species described by Fabricius under that name. Fleutiaux and Sallé (1890) record specimens collected at Vieux Fort, Guadeloupe, by Vitrac on a climbing shrub (*Tecoma pentaphylla*). Kerremans (1906) records it from Cayenne, Santa Lucia, and Guadeloupe in the collection of the Paris Museum.

Through the kindness of the British Museum I have been able to examine two females from their collection, one labeled Antilles (Fairmaire) which had been compared and agrees with *Buprestis depressa* in the Linnean Collection by C. O. Waterhouse, and from which the above description was made: the other specimen is with-

out locality, but is labeled "*karakera* Chev., compared with type (Saunders 74-18)." This specimen is more coarsely punctured, more brightly colored and more acuminate posteriorly, otherwise the two specimens are identical.

This species resembles *thomae* very closely, but it is more slender, more brightly colored, more acuminate posteriorly, and the elytral costae are more strongly elevated.

• **POLYCESTA THOMAE** Chevrolat

Polycesta thomae CHEVROLAT, Silbermann's Rev. Ent., vol. 5, 1838, p. 55.—

WATERHOUSE, Ann. and Mag. Nat. Hist., ser. 7, vol. 14, 1904, p. 254.—

KERREMANS, Mon. Bupr., vol. 1, 1906, p. 516.

Female.—Robust, broadly elongate, and similar to *porcata*, broadly rounded in front, more narrowly rounded behind and feebly convex above; color above aeneo-nigris, with a strong greenish and purplish tinge; beneath of the same color as above only more shining.

Head flat, broadly obsoletely depressed on the front, and transversely, narrowly depressed between the antennal cavities; occiput without longitudinal carina; surface coarsely, rather deeply and densely punctate, the punctures variable in size, irregularly placed, and more or less confluent, sparsely clothed with fine long erect hairs, the intervals irregular in shape, convex, smooth, and shining; epistoma broadly, but not deeply arcuately emarginate in front. Pronotum strongly transverse, two times as wide as long, slightly narrower in front than behind, and widest at basal third; sides strongly obliquely expanded from the apical angles to basal third, where they are broadly rounded, then strongly narrowed to the posterior angles, which are nearly rectangular; anterior margin deeply arcuately emarginate, with a broadly rounded median lobe, and the margin smooth and feebly elevated; base bisinuate, with the median lobe rather strongly angulated; disk with a broad, moderately deep median depression; surface coarsely, deeply and densely punctate, the punctures coarser, and more or less confluent in the median depression and toward the antero-lateral areas, sparsely clothed with a few moderately long recumbent hairs, the intervals densely granulate and subopaque. Scutellum subquadrate, wider behind than in front, and feebly elevated. Elytra feebly convex, about as wide as pronotum at base; humeral angles obtusely angulated; sides feebly expanded behind the humeral angles, sinuate at the posterior coxae, nearly parallel to apical third, then arcuately attenuate to the tips, which are conjointly broadly rounded, the lateral margins coarsely and irregularly serrate posteriorly; each elytron with four smooth longitudinal costae, of which the two discal ones are straight and more strongly elevated than the intercostae, the scutellar costa absent; there are also ten longitudinal rows of large deep elliptical

punctures which are arranged in double rows between the costae, the punctures more or less confluent, very variable in size and shape, and forming a network of alveolus areas, the sutural and lateral margins coarsely and densely punctate; humeri feebly developed. Abdomen beneath coarsely, densely punctate, and rather densely clothed with moderately long recumbent hairs, the intervals smooth and shining; first segment feebly convex, without a densely punctured and pubescent median spot; last segment rather broadly rounded at apex. Prosternum moderately convex; surface sparsely, coarsely punctate, and sparsely clothed with fine, moderately long, recumbent hairs; anterior margin feebly, broadly emarginate in front, with a small lobe on each side, and where the margin is feebly elevated; prosternal process short, very broad, feebly convex, and without marginal grooves, the sides parallel to middle of anterior coxal cavities, where they are emarginate and abruptly narrowed, the apex very broadly rounded.

Male.—Not seen.

Length, 20–25 mm.; width, 8–9.5 mm.

This species was described by Chevrolat (1838) from the island of St. Thomas. Kerremans (1906) records specimens from the same island in the collection of the British Museum and also in the Paris Museum. Kerremans has placed this species as a synonym of *porcata* Fabricius, but Waterhouse (1904) writes that the type of *thomae* is in the collection of the British Museum, and that it is distinct from *porcata*.

I have examined two females of this species, one from the collection of the British Museum simply labeled St. Thomas; the other in the collection of the American Museum of Natural History, from the same locality, collected during July, 1915, probably by C. Shoemaker. After carefully examining the above specimens, I agree with Waterhouse that it is distinct from *porcata*. The punctuation on the elytra is finer and more regular, the four costae on disk are distinctly elevated, and the scutellar costae are entirely absent.

Genus ACMAEODERA Eschscholtz

- Acmaeodera* ESCHSCHOLTZ, Zool. Atlas, vol. 1, 1829, p. 9 (reprint p. 8).—
SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 274–275, pl. 10,
fig. 7.—CASTELNAU and GORY, Mon. Bupr., vol. 1, 1835–1836, pp. 1–31,
pls. 1–9.—SPINOLA, Ann. Soc. Ent. France, ser. 1, vol. 7, 1838, p. 341.—
LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 66–68.—HORN, Trans. Amer.
Ent. Soc., vol. 7, 1878, pp. 2–27, pl. 1.—FALL, Journ. N. Y. Ent. Soc.,
vol. 7, 1899, pp. 1–37.—KERREMANS, Wytzman's Gen. Insectorum, fasc.
12, pt. 1, 1902, pp. 27–37; Mon. Bupr., vol. 2, 1906–1907, pp. 1–523,
pls. 11–16.

Head flat or feebly convex; front strongly narrowed by the insertion of the antennae; epistoma very short and emarginate in front;

antennal cavities rather large, deep, transverse, reniform, not concealed beneath a carina, and situated at some distance from the inner margin of the eyes. Antennae rather short, first joint long, feebly arcuate, and clavate at apex, second, third, and fourth short, subglobular, and subequal in length, fifth to tenth serrate, wider than long (sometimes serrate from the fourth joint), the eleventh joint oval. Eyes large, narrowly oval, feebly convex, parallel, or at most only obsoletely more widely separated on the vertex than at the front. Pronotum strongly transverse, variable in shape, often wider than the elytra, depressed, sulcate or convex at the middle, truncate at the base, which is longitudinally striate along the entire width. Scutellum not visible. Elytra variable in form, rounded or acuminate at the apex, with the sides serrate posteriorly. Sternal cavity formed entirely by the mesosternum, which is entire and emarginate in front. Prosternum wide, flat or convex, the anterior margin sinuate, emarginate, truncate, or lobed at the middle, and the prosternal process usually broadly rounded at apex. Posterior coxae dilated internally. Legs rather short and slender; tarsi rather robust, the fifth joint nearly as long as the preceding joints united; tarsal claws dentate.

This is a very large genus and at present contains about 300 species, which are distributed throughout the warmer regions of the entire world, with the exception of Australia, where they are replaced by the genus *Stigmodera*. The present paper includes 9 species, 4 of which are described as new.

The adults are usually found feeding on the pollen of various flowers, and since the color markings are so variable in some species, they are exceedingly difficult to identify. The species of this genus can be readily separated from all other West Indian Buprestidae by the scutellum being invisible.

KEY TO THE SPECIES

1. Antennae serrate from the fourth joint; subcylindrical species..... 2.
Antennae serrate from the fifth joint..... 3.
2. Elytral markings consisting of nine small yellow spots on each elytron, arranged in two rows, one lateral, the other near the suture; yellow spot on pronotum small and not attaining the base..... *subcylindrica* Fisher.
Elytral markings consisting of a small yellow spot near the scutellum, an oblong lateral area behind the humeri enclosing a dark spot, and three transverse fasciae behind the middle; yellow spot on pronotum large, extending over the entire postero-lateral area..... *jamaicensis* Fisher.
3. Pronotum distinctly wider than elytra..... 4.
Pronotum not wider than elytra..... 5.
4. First abdominal segment with a large yellow basal spot at middle; elytra orange-yellow, with the suture, apex and four transverse spots along lateral margin black, the black sutural area is also irregularly expanded, punctuation very coarse and deep, and the intervals very narrow and acute on top..... *marginenotata* Chevrolat.

- First abdominal segment without yellow basal spot; elytra black without discal markings, but with a yellow marginal band behind the humeri, and two transverse reddish-yellow fasciae near apex, which are more or less confluent, punctuation fine, the intervals at least as wide as the striae and flattened on top----- *flavomarginata* (Gray).
5. Body robust and triangular, enlarged at base, and very acuminate posteriorly----- 6.
Body more slender and elongate, not triangular; elytra more parallel and not as strongly acuminate posteriorly----- 8.
6. Sutural margin expanded and smooth on basal half; elytra without red apical spot----- 7.
Sutural margin not expanded on basal half; elytra with a fiery red apical spot----- *cruenta* (Olivier).
7. Broadly triangular; elytra one and one-half times as long as the width at base, the maculation consisting of numerous small irregular yellow spots, which are confluent----- *pulcherrima* Jacquelin Duval.
More elongate-triangular; elytra two times as long as the width at base, the maculation consisting of a yellow scutellar spot, and four irregular transverse yellow fasciae, which are more or less interrupted.
- wickhami Fisher.
8. Pronotum widest at basal third or middle----- *cubaeola* Jacquelin Duval.
Pronotum widest at base----- *gundlachi* Fisher.

ACMAEODERA SUBCYLINDRICA, new species

Narrowly elongate, subcylindrical, strongly convex, broadly rounded in front and strongly attenuate behind; when viewed in profile, the surface beneath is nearly straight to the last ventral segment, where it is strongly attenuate, above feebly arcuate; piceous, with a strong purplish tinge; pronotum with an oval yellow spot on each side, narrowly separated from the lateral margin but not attaining the base or apex. Each elytron ornated with ten small irregular yellow spots arranged in two longitudinal rows, one along the lateral margin, the other on the disk; in the lateral row the spots are arranged as follows: a very small one at humeral angle, one just behind the humeri, third at the middle, fourth at apical third, fifth at apical fourth, and a small one at the apex; in the discal row they are arranged, one at the base, second at basal third midway between the second and third lateral spots, third behind the middle between the third and fourth lateral spots, and a very small spot connected externally to the fifth marginal spot. Color beneath similar to that above.

Head feebly convex, with a broad, oval, obsolete depression on the front and a short distinct elevated carina on the occiput; surface densely and very coarsely punctate, the punctures rather shallow, irregular, and nearly confluent, the sides forming a network of polygonal areas, bottom of punctures nearly smooth and from which arises a moderately long erect inconspicuous hair; epistoma very broadly arcuately emarginate in front. Antennae serrate from the

fourth joint; first joint elongate, slightly arcuate and longer than the second and third joints united, the surface shining and feebly granulose; second and third joints moniliform, surface similar to the first; fourth to tenth strongly triangular, wider than long, with the surface very densely granulose and subopaque; the eleventh oblong, slightly angulated on outer margin, with the surface similar to the preceding joint. (In the type the right antenna is deformed, and the fourth and fifth joints are consolidated.) Pronotum strongly transverse and moderately convex, one and four-fifths times as wide as long, narrower in front than at base, widest at basal third, with an obsolete depression in front of the scutellum, and a broad shallow one on each side along the base a short distance from the posterior angles, extending forward along the interior margin of the yellow spot but becoming obsolete at its anterior margin, causing the yellow spot to be arcuately elevated, in this depression close to the base there is also a round deep pit; sides arcuately rounded to basal third, then obliquely arcuately narrowed to the anterior margin, which is feebly arcuately emarginate, with a broadly rounded lobe at the middle; base transversely truncate; side margins narrow, and visible from above except near the apical angles; surface densely and very coarsely punctate similar to that of the head. Elytra moderately convex and slightly flattened on disk, as wide at base as pronotum; sides nearly parallel from base to just behind the middle, then arcuately attenuate to the tips, which are rather narrowly, conjointly rounded, the lateral margins strongly serrate posteriorly; humeri strongly developed; striae impressed, about as wide as the intervals on the disk at base, but becoming narrower toward apex, the punctures coarse, deep, oblong and separated from each other in the striae by about one-half their length; intervals not elevated, nearly smooth, with a single series of distant minute punctures, from which arises a rather long erect cinereous hair. Abdomen beneath rather densely, but not coarsely punctate, the punctures shallow, widely separated, and open on the one side, and from which arises a long semierect cinereous hair; intervals obsoletely granulose; last ventral segment rather broadly rounded at apex, and without a subapical carina. Prosternum more coarsely and deeply punctured than abdomen; anterior margin with an obsolete rectangular lobe at middle, which is nearly truncate in front; prosternal process parallel to behind coxae and about two times as wide as the coxal cavity.

Length, 6.5 mm.; width, 2.25 mm.

Type locality.—Cayamas, Cuba.

Other localities.—Camaguey, Cuba.

Type.—Cat. No. 26802, U.S.N.M.

Paratype.—Collection of S. C. Bruner.

Described from two specimens, probably both females. The type was collected by E. A. Schwarz, May 9, 1904, and a paratype received from S. C. Bruner, which was collected at Camaguey, Cuba, during July or August, 1920, by J. Kutz.

This is an elongate subcylindrical species and can be separated from all other West Indian species of this genus, except *jamaicensis*, by the antennae being serrate from the fourth joint. From *jamaicensis* it differs in having the yellow elytral spots arranged in two longitudinal rows, one along the lateral margin, the other near the suture.

ACMAEODERA JAMAICENSIS, new species

Male.—Narrowly elongate, subcylindrical, rounded in front, more acuminate posteriorly and feebly flattened above (nearly straight below and feebly arcuate above when viewed in profile); head and pronotum black, with a feeble aeneous tinge, the latter with a large triangular reddish-yellow spot, situated on each side at the posterior angles, extending internally for about one-third of the width of the pronotum, and along the lateral margin to near the apical angles; elytra black, with a slight purplish tinge, and each elytron ornated with yellow markings as follows: A small spot at base near scutellum, a large oblong area along lateral margin, extending from humerus to middle, and internally to about the middle of the elytron, and enclosing an oblong dark spot, a transverse fascia at apical third, an oblique one just behind it, and a small round spot at the apex; beneath aeneous, with a strong purplish tinge and more shining than above.

Head nearly flat, with an obsolete depression on the front, and a short elevated carina on the occiput; surface densely and coarsely punctate, the bottom of the punctures smooth, and from the center of each arises an erect inconspicuous hair, the intervals rather narrow, smooth and shining; epistoma broadly and deeply arcuately emarginate in front, forming a broadly rounded lobe on each side of the emargination; antennae serrate from the fourth joint, the serrate joints strongly transverse and acuminate at apex. Pronotum rather strongly transverse and moderately convex, nearly two times as wide as long, apex and base nearly equal in width, widest just behind the middle with a small foveate depression in front of the scutellum, and on each side in the yellow area a similar but deeper depression, situated a short distance from the base, there is also a broad obsolete depression extending from this fovea obliquely forward toward the lateral margin; sides arcuately rounded, slightly more obliquely in front than behind, the margins narrowly flattened and only partially visible from above; anterior margin feebly arcuately emarginate, with a distinct angulated median lobe; base

transversely truncate; surface densely and very coarsely punctate, the punctures shallow, irregular, and nearly confluent, the sides forming a network of polygonal areas, bottom of punctures smooth and from each arises a short erect inconspicuous hair. Elytra obsoletely flattened above, equal in width to the pronotum at middle, and rectangular at humeral angles; sides nearly parallel to behind the middle, (feebly sinuate at posterior coxae), then arcuately attenuate to the tips, which are conjointly rounded, the lateral margins serrate to near the base, the teeth fine at the basal regions, but becoming very coarse toward the apex; humeri strongly developed; surface striato-punctate, the striae on disk feebly impressed and wider than the intervals at base, becoming more deeply impressed and narrower toward the apex, the punctures large, very deep, and more or less confluent on the basal region, becoming finer and more shallow posteriorly, the intervals very narrow and somewhat constricted in front of middle, but much broadened toward the apex, the tops smooth, shining, and with a few fine, remotely placed punctures from which arises short erect black hairs. Abdomen beneath densely and coarsely punctate, the punctures deeply impressed on the basal segments, but becoming smaller, more widely separated and not as deeply impressed toward the apex, sparsely clothed with rather long recumbent cinereous hairs, the intervals smooth and shining; last ventral segment obtusely rounded at apex, and without a subapical carina. Prosternum very coarsely and rather densely punctate, and sparsely clothed with recumbent cinereous hairs; anterior margin with a very feeble median lobe, which is obsoletely arcuately emarginate in front; prosternal process parallel to behind the anterior coxal cavities, scarcely two times as wide as the cavities, and broadly rounded at the apex.

Length, 7.5 mm.; width, 2.75 mm.

Type locality.—Jamaica.

Type.—British Museum.

This species is described from a single male received through the kindness of the British Museum. It is simply labeled Jamaica without any additional data and was received under the manuscript name *jamaicensis*, which I have retained for the species.

It is one of the elongate subcylindrical species and can be separated from all the other West Indian species of this genus, except *subcylindrica* Fisher, by the antennae being serrate from the fourth joint. From that species it can be distinguished by the yellow elytral markings, which are not broken up into two longitudinal rows of small spots, but has a large lateral area behind the humeri enclosing a dark spot and with transverse fasciae toward the apex.

ACMAEODERA MARGINENOTATA Chevrolat

Acmaeodera marginenotata CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, pp. 583-584 (separate pp. 150-160).—GUNDLACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, 1891, p. 167, no. 809.—KERREMANS, Mon. Bupr., vol. 2, 1906, pp. 56-57.

Acmaeodera cubaccola FALL, Journ. N. Y. Ent. Soc., vol. 7, 1899, p. 35. (Not *cubaccola* Jacquelin Duval.)

Broadly elongate, feebly triangular, broadly rounded in front, more attenuate posteriorly, and feebly flattened above (nearly straight below and broadly arcuate above when viewed in profile); head and pronotum black, with a slight purplish tinge, the latter with a large triangular yellow spot, situated on each side at the posterior angles; elytra orange-yellow, the suture, apex, and four transverse spots along the lateral margin black, the black color along suture is also expanded into numerous irregular fasciae, which sometimes extend to the middle of the elytron; beneath black, with a strong aeneo-viridis reflection, and ornated with a large round median yellow spot at base of first abdominal segment.

Head flat, with a short elevated carina on the occiput; surface coarsely and densely punctate, the punctures rather shallow, nearly confluent, and from the center of each arises a rather long semi-erect cinereous hair, the intervals narrow and feebly shining; epistoma strongly elevated, very short, and narrow on the top, the anterior margin broadly and very deeply arcuately emarginate in front, and the lobes on each side of the emargination subtruncate and strongly compressed; antennae serrate from the fifth joint. Pronotum strongly transverse and moderately convex, twice as wide as long, distinctly narrower in front than behind, widest just behind the middle, with three large deep basal depressions, one median, and one on each side at the inner margin of the yellow spot, there is also a narrow transverse depression along the anterior margin, more or less interrupted at the middle; sides strongly obliquely expanded to the middle, then strongly arcuately rounded to the posterior angles, which are rectangular, the margins feebly flattened posteriorly and visible from above; anterior margin arcuately emarginate, with a strongly angulated median lobe; base transversely truncate; surface densely, coarsely and very deeply punctate, the punctures confluent and irregular in shape, with their sides acute on the top and forming a network of polygonal areas, bottom of punctures obsoletely granulose, and from which arises a short, semi-erect black hair. Elytra convex, feebly flattened on top, and sharply deflexed on the sides, distinctly narrower than the pronotum at middle, the humeral angles when viewed laterally are bent downward into a narrow lobe; sides when viewed from above are feebly obliquely narrowed to the apical third, then arcuately

attenuate to the tips, which are conjointly broadly rounded, the lateral margins rather coarsely serrate from apex to the posterior coxae; humeri feebly developed; surface with a more or less distinct costa on each side at the lateral declivity, the sutural margins rugose, with a strongly elevated carina at the middle, and without any visible suture between the elytra, the surface is also striato-punctate, the striae very wide, the punctures coarse, extremely deep and nearly connected in the striae, the intervals between the striae very narrow, acute on top, with the surface coarsely granulose, and clothed with a few remotely placed, coarse, erect black hairs, the striae becoming broader and more convex on the lateral deflexed areas. Abdomen beneath densely and coarsely punctate, the punctures deep and nearly confluent on the basal segments, becoming more shallow toward the apex, sparsely clothed with long recumbent cinereous hairs, and with the intervals obsoletely granulose; last segment broadly rounded at apex, without a subapical carina. Prosternum coarsely, densely punctate, and sparsely clothed with recumbent cinereous hairs, intervals coarsely and finely granulose; anterior margin with a distinct median lobe, which is elevated and feebly arcuately emarginate in front; prosternal process strongly convex, parallel to behind the anterior coxal cavities, about two times as wide as the cavities, and very broadly rounded at the apex.

Length, 7.5 mm.; width, 3.5 mm.

Described by Chevrolat (1867) from Cuba and recorded by him from the central part of the island, from material in the collections of Gundlach and Poey. Gundlach (1891) reports collecting it on the flowers of a shrub at Caimanera and Cienfuegos. Kerremans (1906) records it from Cuba but states that the species is unknown to him. This species is not represented in the Poey collection in Philadelphia, but there is a single example labeled No. 809 in the Gundlach Museum in Habana, which has not been available for study.

This species seems to be very rare in collections and I have not seen any specimens of it from the West Indies, but there is a specimen in the United States National Museum from Key Largo, Florida, which agrees with the description given by Chevrolat, and from which the above description was made. It is a very distinct species, extremely coarsely and deeply punctate, sides of the elytra strongly deflexed at lateral margins, humeral angles produced into a narrow lobe, and with a large yellow basal spot at middle of the first abdominal segment. In the specimen examined the elytra seem to be connate, as no suture could be seen between the two elytron, but on account of it being a unique specimen, no dissections could be made. This is the specimen recorded by Fall (1899) as *cubaecola* Jacquelin Duval, based on an identification made by Linell.

ACMAEODERA FLAVOMARGINATA (Gray)

Buprestis flavomarginata GRAY, Griffith's Anim. Kingd., vol. 14, 1832, p. 358, pl. 31, fig. 2.

Acmaeodera flavomarginata CHEVROLAT, Coléoptères du Mexico, Cent. 1, 1834.—CASTELNAU and GORY, Mon. Bupr., vol. 1, 1835, pp. 2-3, pl. 1, fig. 2.—SAUNDERS, Catal. Bupr., 1871, p. 79.—HORN, Trans. Amer. Ent. Soc., vol. 7, 1878, p. 8, pl. 1, fig. 4.—WATERHOUSE, Biol. Centr.—Amer. Coleopt., vol. 3, pt. 1, 1882, p. 21; 1889, p. 178.—FALL, Journ. N. Y. Ent. Soc., vol. 7, 1899, p. 8.—FLEUTIAUX and SALLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, 1890, p. 405 (separates p. 55).—KERREMANS, Mon. Bupr., vol. 2, 1906, pp. 31-34.

Acmaeodera proxima WATERHOUSE, Biol. Centr.—Amer. Coleopt., vol. 3, pt. 1, 1889, pp. 178-179.

Acmaeodera contigua KERREMANS, Mem. Soc. Ent. Belg., vol. 6, 1897, p. 42.

Elongate, feebly triangular, broadly rounded in front, more acuminate posteriorly, and feebly flattened above (nearly straight beneath and moderately arcuate above when viewed in profile); piceous, with a slight aeneous tinge; pronotum with a lateral yellow longitudinal band, not quite touching the lateral margin, and sometimes abbreviated anteriorly; elytra without discal markings, but with a yellow marginal band extending from the humeri to a little behind the middle, and becoming slightly wider posteriorly, and with two transverse reddish or yellowish fasciae near the apex, the two fasciae sometimes connected, forming a broad band, and enclosing one or more small dark spots; beneath more shining than above.

Head nearly flat, with a broad, moderately deep, oval depression on the front, and forming two more or less distinct elevations; occiput with a longitudinal carina extending to the frontal depression; surface densely and coarsely punctate, the punctures rather deep, irregular, and nearly confluent, the sides forming a network of polygonal areas, bottom of punctures smooth and from the center of which arises a long erect inconspicuous hair; epistoma broadly and deeply triangularly emarginate in front, with the lateral angles broadly rounded; antennae serrate from the fifth joint. Pronotum strongly transverse and moderately convex, two and one-half times as wide as long, distinctly narrower in front than behind, widest at basal sixth, with a large, rather deep median depression, which is broader posteriorly, and with a small very deep depression on each side near the base, about midway between the middle and lateral margin; sides obliquely expanded from apical angles to basal sixth, where they are arcuately rounded, the margins rather broadly flattened and visible from above; anterior margin deeply arcuately emarginate, with a broadly rounded lobe at the middle; base transversely truncate, the posterior angles obtusely rounded; surface densely, coarsely and regularly punctate, the punctures well separated on the disk, but becoming denser and more confluent toward

the sides, and from each puncture arises a long erect inconspicuous hair. Elytra slightly flattened on disk, not quite as wide as pronotum; humeral angles obtusely angulated; sides feebly obliquely narrowed to behind the middle, then arcuately attenuate to the tips, which are conjointly acutely rounded, the lateral margins coarsely serrate posteriorly; humeri strongly developed; surface striato-punctate, the striae impressed, nearly as wide as the intervals on the disk at base, becoming much narrower toward the apex, and rather widely separated at the sides, the striae punctures deep, coarse, and separated by about their own diameter, becoming finer and more oblong toward the apex; intervals flat on the disk, more convex laterally, with a single row of distant minute punctures, from which arises a rather long erect inconspicuous hair, the fifth interval costate, sometimes obsolete apically, but it is always distinct at the base. Abdomen beneath rather densely but not coarsely punctate, the punctures shallow and open posteriorly, and sparsely clothed with long inconspicuous hairs, the intervals smooth and shining; last ventral segment broadly rounded at apex, without a distinct subapical carina. Prosternum more coarsely and deeply punctate than the abdomen; anterior margin feebly arcuately emarginate at the middle, with a distinct lobe on each side of the emargination; prosternal process parallel to behind the anterior coxae, nearly three times as wide as the coxal cavity, and feebly broadly rounded at apex.

Length, 8–13 mm.; width, 3.2–4.75 mm.

This species was described originally by Gray (1832) from Brazil. Saunders (1871), and Fleutiaux and Sallé (1890) record it from Guadeloupe. Waterhouse (1889) described the same species from Mexico as *proxima*, and Kerremans (1897) also described the species from Guadeloupe under the name of *contigua*. Only two specimens of this species from the West Indies have been examined, and both of these were received from the British Museum, one labeled "Guadeloupe (Fairm)," the other Guadeloupe (Plason) and labeled type of *contigua* Kerremans.

The species is widely distributed from Texas southward to Brazil, but so far, has only been recorded from one of the West Indian Islands. In a species so widely distributed, a great variation would naturally be expected, but the only variation seen in a series of specimens examined from widely separated regions, is that of the transverse reddish or yellowish fasciae near the apex of the elytra, and which has caused it to be described under a number of different names. In some specimens the two fasciae are distinctly separated, while in others they are more or less connected, forming a broad band and enclosing one or more small dark spots.

ACMAEODERA CRUENTA (Olivier)

Buprestis cruenta OLIVIER, Entomol., vol. 2, gen. 32, 1790, pp. 48-49, pl. 3, fig. 21.

Acmaeodera cruenta CASTELNAU and GORY, Mon. Bupr., vol. 1, 1835, p. 2, pl. 1, fig. 1.—MANNERHEIM, Bull. Soc. Imp. Nat. Moscou, vol. 10, no. 8, 1837, p. 24.—KERREMANS, Mon. Bupr., vol. 2, 1906, pp. 50-53.

Robust, rather short, strongly triangular, broadly rounded in front, more acuminate posteriorly, and feebly flattened above, nearly straight beneath and moderately arcuate above when viewed in profile; head and pronotum aeneous, the latter with a large triangular reddish-yellow spot, situated on each side along the lateral margin, broader posteriorly and not reaching to the apical angles; elytra black, with a strong bluish or greenish tinge, each elytron with an oblong reddish-yellow spot near apex and ornated with from seven to nine rather large irregular yellow spots arranged in two longitudinal rows, one near the suture, the other along the lateral margin, the spots in the lateral row usually consists of a very small one at humeral angle, and three transverse ones, one at the basal third, one at the middle, and the other at the apical third, those in the sutural row vary in number from four to five, irregular in size, and not always arranged in a straight line; beneath aeneous, with a distinct olivaceous tinge, and more shining than above.

Head flat, with a distinct longitudinal carina on the occiput; surface densely and coarsely punctate, the punctures rather deep, irregular, and nearly confluent, smooth in the bottom, and from the center of which arises a long, erect inconspicuous hair, the intervals smooth and shining; epistoma broadly arcuately emarginate in front, forming a broadly rounded lobe on each side of the emargination; antennae serrate from the fifth joint. Pronotum strongly transverse and moderately convex, two and one-fourth times as wide as long, distinctly narrower in front than behind, widest at base, with a broad triangular obsolete depression at the middle along the base, and on each side a round, deep, foveate depression, situated a certain distance from the base and at the inner margin of the lateral yellow spot, which is gibbose; anterior margin very deeply arcuately emarginate, with an obsolete median lobe; sides arcuately expanded from the anterior margin to posterior angles, which are obtuse, the margins narrowly flattened, bent under posteriorly, and not visible from above, except toward the apical angles; base transversely truncate; surface densely and deeply punctate, the punctures fine and rather widely separated on the disk, and becoming much coarser and more confluent at the sides, especially on the yellow spaces, sparsely clothed with long, erect, inconspicuous hairs, intervals smooth and shining. Elytra slightly concave on disk, and abruptly declivous on the sides and at apex, and slightly wider than pronotum at base;

humeral angles obtusely angulated; sides obliquely attenuate to apical third, then more arcuately attenuate to the tips, which are conjointly acutely rounded, the lateral margins coarsely serrate posteriorly; humeri strongly developed; surface striato-punctate, in the concave area the striae are deeply impressed, about one-fourth as wide as the intervals, and the punctures fine, elongate and confluent in the striae, toward the sides the striae are feebly impressed, nearly as wide as the intervals, and the punctures very coarse, and more or less confluent; intervals flat on the disk, becoming more convex laterally, and with a row of fine, densely placed punctures, from the center of which arises a long erect black hair. Abdomen beneath densely, finely and rather regularly punctate, and sparsely clothed with short erect cinereous hairs, intervals smooth and shining; second segment with a round obsolete depression at middle along anterior margin; last segment broadly rounded at apex; without a subapical carina. Prosternum punctate similar to that of the abdomen; anterior margin with a distinct median lobe, which is deeply arcuately emarginate in front; prosternal process parallel behind the anterior coxae, at least two times as wide as the coxal cavity, and broadly rounded at apex.

Length, 8–11 mm.; width, 4–5 mm.

Originally described by Oliver (1790) from Santo Domingo. Mannerheim (1837) records it from the same island on the foliage of *Crotinus cascarillae*, and from all accounts the distribution of this species is restricted to that island. The following material has been examined. Coll. U. S. Nat. Mus.: One specimen from Port-au-Prince, Haiti (W. L. Rockwell), and another one from the same locality collected by R. J. Crew, and received from H. F. Wickham. Coll. British Museum: One specimen, Haiti (Saunders 74–18); one labeled simply St. Domingo, and a third specimen, labeled Haiti (Mus. Paris, Chevrolat Coll.).

In size and form this species resembles *pulcherrima* Jacquelin Duval, but it can be easily separated from that species by the elytra having the apex fiery red, and the yellow markings arranged in two longitudinal rows on each elytron.

ACMAEODERA CUBAECOLA Jacquelin Duval

Acmaeodera cubaecola JACQUELIN DUVAL, in Ramon de la Sagra's Hist. Phys. Polit. et Nat de l'île de Cuba, Anim. Artic., 1857 (French Edition), pp. 57–58; (Spanish Edition) vol. 7, 1857, pp. 26–27.—CHREVOLAT. Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 583 (separates, p. 159).—GUNDLACH, Contribution à la Entomol., Cuba, vol. 3, pt. 5, 1891, p. 167, no. 1414.—KERREMANS, Mon. Bupr., vol. 2, 1906, pp. 61–63, pl. 11, fig. 5.

Narrowly elongate, subcylindrical, rounded in front, more acuminate posteriorly, and strongly convex above, sinuate below and

feebly arcuate above when viewed in profile; head and pronotum nigro-aeneous, the latter with a more or less triangular yellowish spot, situated on each side along the lateral margin, and not quite reaching to the posterior angles nor anterior margin; elytra nigro-aeneous, with a strong cyaneous or purplish tinge, and ornated with numerous small yellow spots, which are arranged on each elytron as follows: A small round one at base near scutellum, a narrow longitudinal one along lateral margin behind humerus, and strongly sinuate on the inner margin, four small ones on median part, arranged obliquely in pairs, and a small spot near the apex, sometimes the spots more or less confluent, and with an additional one along the suture in front of apex; beneath aeneous, with a strong cupreous or brownish tinge.

Head flat, with a short elevated carina on the occiput; surface coarsely and densely punctate, the punctures more or less confluent, and the sides forming a network of polygonal areas, the bottom of the punctures smooth, and from the center of each puncture arises an erect inconspicuous hair; epistoma broadly and rather deeply arcuately emarginate in front, forming an arcuately rounded lobe on each side of the emargination; antennae serrate from the fifth joint. Pronotum moderately transverse, and rather strongly convex, one and one-half times as wide as long, distinctly narrower in front than behind, widest at basal third, with an obsolete depression at middle along base, and on each side near the inner margin of the yellow space a deep foveate depression, situated a short distance from the base; sides obliquely expanded to basal third, where they are arcuately rounded to the posterior angles, which are nearly rectangular and bent downward, the margins not flattened, and visible from above; anterior margin arcuately emarginate, with a broadly rounded median lobe; base transversely truncate; surface densely and very coarsely punctate, the punctures shallow, nearly confluent, and the intervals smooth and shining, rather densely clothed with short erect inconspicuous hairs. Elytra convex, equal in width to pronotum at base, and rectangular at humeral angles; sides parallel to near apical third, then obliquely attenuate to the tips, which are conjointly obtusely rounded, the lateral margins rather strongly serrate posteriorly; humeri strongly developed; surface striato-punctate, the striae on disk feebly impressed and wider than the intervals anteriorly, becoming more deeply impressed and much narrower toward the apex, the punctures large, round and placed close together in the striae on the basal half, but becoming much smaller posteriorly, the intervals with a single row of remotely placed small punctures, and with a few short erect hairs. Abdomen beneath densely and coarsely punctate, the punctures

deeply impressed on the basal segments, but becoming more shallow toward the apex, and rather densely clothed with long recumbent cinereous hairs, intervals smooth and shining; last segment broadly rounded or subtruncate at apex, without a subapical carina. Prosternum coarsely, densely punctate, and sparsely clothed with long recumbent hairs; anterior margin with a very feeble median lobe, which is truncate in front; prosternal process parallel to behind the anterior coxal cavities, and broadly rounded at the apex.

Length, 8.5–10 mm.; width, 2.75–3.5 mm.

Described by Jacquelin Duval (1857) from Cuba. Chevrolat (1867) records it from the eastern part of the same island from material in the collections of Gundlach, Poey, and Chevrolat. Gundlach (1891) records collecting it on a flowering shrub at Caimanera, Cuba, during July. Kerremans (1906) has placed *cubaecola* listed by Fall¹³ from Key Largo, Florida, and *pulcherrima* by the same author¹⁴ from Metacumbe Key, Florida as synonyms of *cubaecola*, but the one listed by Fall as *cubaecola* is the species described by Chevrolat as *marginenotata*.

I have been able to examine two specimens of this species from the collection of the Academy of Natural Sciences, labeled Cuba (Poey Coll. No. 348), which agree with the original description, and from which the above description was made. (One of these specimens has been donated to the U. S. Nat. Mus. Coll.). There are also two examples of this species labeled No. 1419 in the Gundlach Museum in Habana, and a single example in the British Museum, which have not been examined by the writer.

The species is closely related to *confusa* Fisher, but is more parallel and subcylindrical, more convex above, pronotum not sulcate at base, and the markings on the elytra are more irregular and not arranged in two longitudinal rows of distinct round spots.

ACMAEODERA CONFUSA, new name

There seems to have been considerable confusion in the identification of this species by Kerremans, since *pulcherrima* and *cubaecola* listed by Fall are two radically different species, but neither one is the species described by Jacquelin Duval as *cubaecola*. Kerremans probably did not see the true *cubaecola* from the Antilles, as he redescribed and figures specimens from the Fenyès collection from Key Largo, Florida, which are identical with the specimens listed by Fall as *pulcherrima* from Metacumbe Key, Florida. For the one described and figured by Kerremans as *cubaecola* and listed by Fall as *pulcherrima*, I therefore propose the new name *confusa*.

¹³ Journ. N. Y. Ent. Soc., vol. 7, 1899, p. 85.

¹⁴ Idem, p. 16.

ACMAEODERA PULCHERRIMA Jacquelin Duval

Acmaeodera pulcherrima JACQUELIN DUVAL, in Ramon de la Sagra's Hist. Phys. Polit. et Nat de l'île de Cuba, Anim. Arctic., 1857 (French Edition), pp. 56-57; (Spanish Edition) vol. 7, 1857, p. 26.—CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 583 (separates p. 159).—GUNDLACH, Contribucion à la Entom. Cuba, vol. 3, pt. 5, 1891, pp. 166-167, no. 808.—FALL, Journ. N. Y. Ent. Soc., vol. 7, 1899, p. 16.—KERREMANS, Mon. Bupr., vol. 2, 1906, pp. 53-54, pl. 11, fig. 3.

Robust, rather short, strongly triangular, broadly rounded in front, more acuminate posteriorly, and rather moderately convex above (nearly straight or at most only feebly arcuate beneath, and strongly arcuate above when viewed in profile); head and pronotum æeneous, with a slight cupreous tinge, the latter with an irregular reddish-yellow spot, situated on each side along the lateral margin, broader posteriorly and not quite reaching to the posterior nor apical angles; elytra black, with an æeneous, greenish or cupreous tinge, and ornated with numerous small irregular yellow markings, which are variable in size and shape, and giving the surface a variegated or marbled appearance; beneath æeneous, with a strong cupreous tinge, and more shining than above.

Head flat, feebly depressed on the front, and with a distinct longitudinal carina on the occiput; surface densely and coarsely punctate, the punctures not very deep, smooth in the bottom, and from the center of each arises a short, erect inconspicuous hair, the intervals smooth and shining; epistoma broadly arcuately emarginate in front, forming an acutely rounded lobe on each side of the emargination; antennae serrate from the fifth point. Pronotum strongly transverse, and moderately convex, two and one-half times as wide as long, distinctly narrower in front than behind, widest at base, with an obsolete longitudinal median sulcus, a narrow transverse depression along the anterior margin, broadly interrupted at the middle, and on each side along the inner margin of the yellow space, a broad obsolete depression, extending to a round deep fovea situated a certain distance from the base; sides strongly obliquely expanded from the anterior margin to the posterior angles, which are nearly rectangular, the margins narrowly flattened and bent under posteriorly, and not visible from above except toward the apical angles; anterior margin actuatedly emarginate, with an obsolete median lobe; base transversely truncate; surface densely and deeply punctate, the punctures fine and distinctly separated on the disk, becoming much coarser and more or less confluent toward the side, and sparsely clothed with short erect inconspicuous hairs, the intervals smooth and shining. Elytra convex, slightly wider than pronotum at base, the sutural intervals broadly expanded on the basal half, the disk convex, smooth and shining; humeral angles nearly rectangular; sides

obliquely attenuate to the apical third, then more arcuately attenuate to the tips, which are acute, the lateral margins coarsely serrate posteriorly; humeri strongly developed; surface striato-punctate, the striae on disk feebly impressed on basal region, about as wide as the intervals, but becoming more deeply impressed and distinctly narrower than the intervals toward the apex, the punctures very coarse and nearly confluent anteriorly; intervals smooth and shining, with a few fine punctures, from which arises a short recumbent hair. Abdomen beneath densely, rather coarsely and regularly punctate, and sparsely clothed with short recumbent cinereous hairs, intervals smooth and shining; last ventral segment broadly rounded at apex, and without a subapical carina. Prosternum punctured similar to that of the abdomen; anterior margin with a distinct median lobe, which is deeply arcuately emarginate in front; prosternal process parallel to behind the anterior coxal cavities, at least two times as wide as the cavity, and broadly rounded at the apex.

Length, 9–12 mm.; width, 4.5–5.5 mm.

This species was described by Jacquelin Duval (1857) from Cuba. Chevrolat (1867) records it from the central and eastern part of the same island, from material in the collections of Gundlach, Poey, and Chevrolat. Gundlach (1891) records collecting adults on the flowers of a shrub at Caimanera and also at the Bay of Guantanamo, Cuba. Fall (1899) records three specimens of this species in the collection of the United States National Museum from Metacumbe Key, Florida, based on identifications made by Linell. These specimens are not the species described by Jacquelin Duval as *pulcherrima*, but are *confusa* Fisher. Kerremans (1906) records it from Cuba, in the collection of the Brussels Museum.

Specimens have been examined from the following Cuban localities. Coll. U. S. Nat. Mus.: One specimen, Santiago (J. M. Espin). Coll. Amer. Mus. Nat. Hist.: One specimen, Rio Seco, San Carlos Estate, Guantanamo (Chas. T. Ramsden). Coll. British Mus.: One specimen, Cuba (Coll. Chevrolat); and another one without a locality, and simply labeled "Saunders 74–18." Coll. Acad. Nat. Sci. Phila.: Two specimens, Cuba (Poey Coll. No. 931). There are also two specimens labeled No. 808 in the Gundlach Museum in Habana, which have not been examined.

There has been considerable confusion in regard to the identification of this species and *cubaecola*, but the two species are distinctly different, *pulcherrima* is a very broad, triangular species, with the pronotum widest at base, while *cubaecola* is narrow, elongate, and subcylindrical, the pronotum widest at middle or basal third, the sutural intervals broadly expanded on basal half, and the color markings on the elytra are differently arranged.

ACMAEODERA WICKHAM, new species

Acmaeodera cubaecola WICKHAM, Canad. Entomol., vol. 27, 1895, p. 295
(not *cubaecola* Jacquelin Duval).

Male.—Rather broadly elongate, feebly triangular, broadly rounded in front, strongly acuminate posteriorly and moderately convex above (feebly sinuate below and broadly arcuate above when viewed in profile); head and pronotum aeneous, with a strong cupreous or purplish tinge, the latter with a large, more or less triangular yellow spot situated on each side along the lateral margin, broader and more elevated posteriorly, not touching the lateral margin, nor extending to the anterior or posterior angles; elytra black, with a purplish, greenish or bluish tinge, and each elytron ornated with yellow markings as follows: A small round spot at humeral angle, a transverse one at base near scutellum, a narrow, irregular transverse fascia at basal fourth, a similar one at middle, a more arcuate one at apical third, and a smaller one near the apex, all of these fasciae are more or less interrupted; beneath aeneous, with a strong cupreous or purpureous reflection, and more shining than above.

Head flat, with a short elevated carina on the occiput; surface densely and coarsely punctate, the punctures shallow, more or less confluent, and the sides forming a network of polygonal areas, the bottom of the punctures smooth and with a short erect hair at the middle, the intervals narrow, irregular in shape, smooth and shining on the top; epistoma broadly and deeply arcuately emarginate in front, forming a broadly rounded lobe on each side of the emargination; antennae serrate from the fifth joint. Pronotum strongly transverse and moderately convex, two and one-third times as wide as long, distinctly narrower in front than behind, widest at base, with an obsolete impression in front of the scutellum, a narrow transverse depression along anterior margin, broadly interrupted at the middle, and on each side near the inner margin of the yellow spot, a deep foveate depression situated a short distance from the base, and a broad obsolete depression extending obliquely toward the lateral margin; sides obliquely and feebly arcuately expanded from anterior margin to the posterior angles, which are rectangular and bent under, the margins narrowly flattened and only visible anteriorly from above; anterior margin strongly arcuately emarginate, with a feebly rounded median lobe; base transversely truncate; surface densely and coarsely punctate, the punctures well separated on the disk, but becoming more or less confluent toward the sides, bottom of punctures finely granulose and from which arises a short, erect inconspicuous hair, intervals smooth and shining. Elytra strongly convex anteriorly, feebly flattened along suture near apex, slightly wider than pronotum at base, and rectangular at the humeral angles;

sides arcuately expanded behind the humeral angles, then arcuately attenuate to the tips (feebly sinuate at posterior coxae), apex rather broadly rounded, lateral margins coarsely serrate posteriorly; humeri strongly developed; surface striato-punctate, the striae on disk wider than the intervals at the basal region, feebly impressed except on the flattened space near apex, where they are more deeply impressed, the punctures large, deep, and closely placed in the striae, the intervals smooth, with a single row of remotely placed fine punctures, from which arises a very short erect hair, sutural intervals broadly expanded at the basal half. Abdomen beneath coarsely and densely punctate, the punctures smaller and less impressed on the apical segments sparsely clothed with rather long recumbent cinereous hairs, intervals smooth and shining; last segment subtruncate at apex, without a subapical carina. Prosternum punctuation similar to that of the abdomen; anterior margin with a distinct median lobe, which is broadly arcuately emarginate in front; prosternal process parallel to behind the anterior coxal cavities, scarcely two times as wide as the cavities, and broadly rounded at the apex.

Length, 8–8.5 mm.; width, 3.5–3.75 mm.

Type locality.—Eleuthera, Bahamas.

Type and paratype.—Cat. No. 26803, U.S.N.M.

Described from two males collected by H. F. Wickham on the island of Eleuthera, one of the Bahamas, between July 9 and 15, and is the species recorded by him in the Canadian Entomologist as *cubaecola* Jacquelin Duval.

This is one of the subtriangular species, not as broadly triangular as *cruenta* and *pulcherrima*, but more so than *gundlachi* Fisher, and can be separated from the other species of the genus found in the West Indies by the characters given in the key.

ACMAEODERA GUNDLACHI, new species

Male.—Rather broadly elongate, subcylindrical, broadly rounded in front, more strongly attenuate posteriorly, and feebly flattened above, nearly straight below and broadly arcuate above when viewed in profile, aeneous, with a strong purplish or greenish tinge on the pronotum and elytra, the former with an oblong yellow spot on each side, which does not attain the base nor apex; each elytron ornated with small irregular yellow spots as follows: A rather large irregular spot behind the humerus, extending along the inner margin, but more or less broken along the lateral margin, a small round spot behind the humerus, situated closer to the suture than the lateral margin, a rather wide transverse arcuate fascia at middle, extending from the lateral margin to middle of disk, then turning obliquely forward for a short distance, a narrow transverse fascia at apical third, extending nearly to the suture, a narrow oblique one at apical

fifth, and a small spot near the apex. Beneath aeneous, with a strong purplish tinge.

Head nearly flat, with a broad obsolete depression on the front, and a very short elevated carina on the occiput; surface densely and coarsely punctate, the punctures rather shallow, and narrowly separated from each other, and from each puncture arises a rather long, erect inconspicuous hair, the intervals smooth; epistoma broadly and deeply arcuately emarginate in front, forming an obtusely angulated lobe on each side of the emargination; antennae serrate from the fifth joint. Pronotum strongly transverse, moderately convex, two time as wide as long, distinctly narrower in front than behind, widest at base, with a narrow obsolete depression along the anterior margin, broadly interrupted at the middle, and with three more or less obsolete basal depressions, one median, and one on each side at the inner margin of the yellow spot, which is not elevated; sides obliquely expanded from anterior margin to posterior angles, which are rectangular, the margins very narrowly flattened, and not visible posteriorly from above; anterior margin feebly arcuately emarginate, with a distinct angulated lobe at middle; base transversely truncate; surface densely and coarsely punctate, the punctures finer and more widely separated on the disk, becoming coarser, deeper, and more narrowly separated toward the sides, and from each puncture arises a long, erect inconspicuous black hair, intervals smooth and shining. Elytra moderately convex, slightly flattened on the disk posteriorly, slightly wider than pronotum at base; sides slightly expanded behind the humeral angles, feebly sinuate and obliquely attenuate to the apical third, then rather strongly arcuately attenuate to the tips, which are conjointly, rather broadly rounded, the lateral margins coarsely serrate, the teeth irregular and widely separated; humeri strongly developed; surface striato-punctate, the striae impressed toward the apex, about as wide as the intervals on the basal region, but becoming narrower on the flattened apical areas, the punctures large, deep, and irregularly placed in the striae, becoming finer and more elongate near the apex, the intervals not elevated, smooth, and with a single row of distant punctures, from which arises a rather long, semierect hair. Abdomen beneath sparsely and rather finely punctate, the punctures much coarser and more widely separated on the basal segment, becoming finer toward the apical segment, and rather densely clothed with long semierect cinereous hairs, intervals smooth; last segment subtruncate at apex, and without a subapical carina. Prosternum coarsely and densely punctate, and sparsely pubescent; anterior margin with a narrow rectangular lobe at middle, which is elevated and truncate in front; prosternal process parallel to behind the anterior coxal cavities, nearly three times as wide as the cavities, and very broadly rounded at the apex.

Length, 8.5 mm.; width, 3.5 mm.

Type locality.—Guanica, Porto Rico.

Other localities.—Anasco, Santa Rita, Tallaboa, Aibonito, and Martin Pena, all in Porto Rico.

Types and paratypes.—Cat. No. 26804, U.S.N.M.

Paratypes also in American Museum Natural History; Carnegie Museum; Academy Natural Sciences, Philadelphia; British Museum; Porto Rico Experimental Station at Rio Pedras; and also in the collection of G. B. Merrill.

This species is described from a series of 15 specimens collected at the following localities in Porto Rico. The type and paratypes A, B, and C, collected at Guanica, April 15, 1914, by G. B. Merrill; paratype D, collected at the same locality June 5, 1920, by G. N. Wolcott; paratypes E, F, and G, collected at Anasco, September, 1913, by E. G. Smyth; paratypes H and I, collected at Santa Rita, July, 1913, by E. G. Smyth; and paratypes J, K, and L, collected at Martin Pena, July 10, 1917, by R. T. Cotton. Coll. Amer. Mus. Nat. Hist.: Paratype M collected at Aibonito, July 15, 1914, by F. E. Watson, and a paratype N collected at Tallaboa, near Ponce, July 23, 1914, by Harry G. Barber.

This species is quite variable in size, form and elytral markings. Paratypes B, H, I, K, and N, agree very closely with the type in size, form and markings; paratype D is not quite as triangular, more flattened above, pronotum more longitudinally sulcate at middle, and the elytral markings are not quite as numerous; paratypes E, F, L, and M, are slightly smaller, and more parallel and subcylindrical; paratypes A, C, G, and J, have the color much darker, and the yellow markings are more or less obliterated.

Genus PSILOPTERA Solier

Psiloptera SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 283-284, pl. 11, fig. 13.—CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837-1838, *Buprestis*, pp. 20-77, pls. 5-19.—LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 27-30.—KERREMANS, Wytzman's Gen. Insectorum, fasc. 12, pt. 2, 1903, pp. 90-103; Mon. Bupr., vol. 5, 1910-1911, pp. 1-566, pls. 27-32.

Lampetis, DEJEAN, Cat. Coleopt., 2 ed., 1833, p. 76; 3 ed., 1836, p. 86.—SPINOLA, Ann. Soc. Ent. France, vol. 6, 1837, p. 113.

Head rugose, sometimes feebly depressed, and wider in front than on the vertex; front not narrowed by the insertion of the antennae; epistoma short, broadly and rather deeply emarginate in front; antennal cavities small, triangular, and armed posteriorly by a strongly elevated, oblique carina, and situated at some distance from the inner margin of the eyes. Antennae moderately long; first joint rather short and robust; second and third very short, globular more slender than the first, the third sometimes slightly longer than

the second; fourth and fifth elongate about equal in length, the fifth sometimes feebly enlarged and angulated at the apex; sixth to tenth moderately dentate on the inner side and subtriangular; eleventh oblong and rounded at apex; the dentate joints armed with poriferous pores and foveae on both sides of the joints. Eyes large, elliptical, strongly convex, and slightly closer to each other on the vertex than at the front. Pronotum wider than long, variable in shape, base bisinuate, and the surface sometimes with smooth shining areas. Scutellum very small and rounded. Elytra very variable, base sinuate, sides smooth posteriorly, sometimes dentate, with the apex emarginate, bidentate or obliquely truncate. Sternal cavity formed by the mesosternum and metasternum; mesosternum divided, the lateral branches long and feebly oblique; metasternum truncate in front, only feebly emarginate at middle, and with a narrow longitudinal median groove on the disk. Prosternum variable; anterior margin truncate, sinuate or lobed; prosternal process rather broad, feebly convex and with a groove along the lateral margins. Abdomen with the first segment broadly sulcate at middle. Posterior coxae strongly dilated internally, the anterior margin sinuate, and the posterior margin more or less emarginate on the interior dilated part. Legs feebly robust; anterior and middle femora feebly swollen at middle, the posterior ones subcylindrical and feebly flattened on both sides; tibiae subcylindrical, the anterior ones sometimes feebly arcuate; tarsi depressed, rather broad, the first joint of the anterior pair not longer than the second joint. Body very variable.

This is a very large genus and includes nearly 500 described species, which are distributed throughout the warmer parts of the world, with the exception of Australia and Oceania. Only a few species are found in Malaysia, where they are replaced by the genus *Ohrysodema*. Eight species have been found in the West Indies, two of which are described in the present paper. Kerremans has divided the genus into four subgenera, but all of the West Indian species, except *fulgida* Olivier, belong to the subgenus *Lamquetis* Dejean, which is separated from the other subgenera by the prosternum not produced at the middle, but with the anterior margin truncate, lobed or feebly sinuate; epistoma short, not separated on the front by a transverse carina, and not declivous in front, nor contracted on the sides. A large number of genera have been placed as synonyms of this genus by Kerremans, but since their distribution do not apply to the fauna covered by the present paper, the citations are omitted.

KEY TO THE SPECIES

1. Prosternum produced in front. (Guadeloupe.)----- *fulgida* (Olivier).
- Prosternum not produced in front.----- 2.

2. Pronotum very rugose, with more or less distinct, longitudinal or transverse smooth spaces----- 3.
Pronotum without longitudinal or transverse smooth spaces; surface rather densely punctures. (Lesser Antilles.)----- *guildini* Castelnau and Gory.
3. Elytra with a longitudinal lateral groove, which is usually filled with a dense pulverulence----- 4.
Elytra without a longitudinal groove----- 5.
4. Reliefs on pronotum and elytra dark green, the depressions bronzy-green, and more or less purplish. (Cuba.)----- *torquata* (Dalman).
Reliefs on pronotum and elytra brownish-black, with a feeble cupreous tinge, and the depressions olive green or aeneous. (Jamaica.)
var. *jamaicensis* Fisher.
5. Pronotum longitudinally sulcate at middle----- 6.
Pronotum not longitudinally sulcate at middle----- 7.
6. Reliefs on pronotum green or violaceous; elytra dark green, with a strong violaceous tinge, the intervals and striae interrupted by numerous distinct aureo-cupreous punctured spaces. (Haiti.)----- *aurifer* (Olivier).
Reliefs pronotum black; elytra more obliquely acuminate posteriorly, aeneo-cupreous, sometimes feebly purplish, the intervals and striae not distinctly interrupted by irregular transverse punctured spaces. (Haiti.)
aurata (Saunders).
7. Pronotum with three distinct smooth spaces; elytra aeneo-cupreous, sometimes with a reddish tinge, and with numerous small depressions which are densely covered with a white pulverulence; body beneath with the median parts fiery red. (Cuba.)----- *straba* Chevrolat.
Pronotum without distinct smooth spaces; elytra bluish, purplish or rubinous, and without depressed pulverulent spaces; body beneath aeneo-cupreous, with a slight bluish or purplish tinge. (Bahamas.)
bahamica Fisher.

PSILOPTERA (PSILOPTERA) FULGIDA (Olivier)

Buprestis fulgida OLIVIER, Entomol., vol. 2, gen. 32, 1790, pp. 10-11, pl. 7, fig. 69.—HERBST, Nat. Syst. Ins. Käfer, vol. 9, 1801, pp. 85-87, pl. 142, fig. 4.

Psiloptera fulgida CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, *Buprestis*, pp. 24-25, pl. 6, fig. 24.—FLEUTIAUX and SALLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, 1890, p. 405. (separates p. 55).—KERREMANS, Mon. Bupr., vol. 5, 1910, pp. 21-22.

Buprestis viridulaurea SCHONHEBB, Syn. Ins., vol. 1, pt. 3, 1817, p. 215.

The following is a translation of Olivier's original description:

Of a brilliant golden green, with a cupreous tinge; elytra striate and bidentate.

It resembles very closely in form and size *Buprestis collaris*. Antennae aeneous and serrate. Body rugose, and of a brilliant golden green color. Prothorax impressed on the upper part; surface rugose, green, with the smooth parts coppery red. Elytra feebly rugose, striate, golden green, with the elevations of the striae coppery red; apex truncate and bidentate. Body beneath rugose, shining, the median parts coppery red and very brilliant. Legs green, with the tarsi bluish.

It is found in Guadeloupe, where it has been collected by the late Mr. Badier. In the collection of Gigot D'Orcy.

Originally described by Olivier (1790) from Guadeloupe, and is recorded from the same locality by Fleutiaux and Sallé (1890). Castelnau and Gory (1837), and also Kerremans (1910) record it from Cayenne, French Guiana, without referring to the type locality, which they have probably overlooked. No specimens have been seen which would apply to the description given for this species. Kerremans¹⁵ records a specimen of *Psiloptera variolosa* Fabricius from Guadeloupe in the Paris Museum, which probably is this species.

PSILOPTERA (LAMPETIS) GUILDINI Castelnau and Gory

Psiloptera guildini CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, *Buprestis*, pp. 41-42, pl. 10, fig. 51.—KERREMANS, Mon. Bupr., vol. 5, 1910, p. 144.

Form broadly elongate, attenuate and broadly rounded in front, more acuminate posteriorly; elytra without marginal grooves; surface uniformly blue or bluish-green above and beneath; tarsi violaceous.

Head nearly flat; occiput with a narrow longitudinal groove; surface strongly and very irregularly rugose, the elevations broadly convex, irregular in size and shape, covering the entire surface, and densely, rather coarsely granulose, the depressions coarsely, sparsely and irregularly punctate, and from each puncture arises a short, erect hair; epistoma broadly and rather deeply arcuately emarginate at the middle, with an obtuse tooth on each side of the emargination. Pronotum about one and three-fourth times as wide as long, distinctly narrower in front than behind, widest along basal third; sides strongly obliquely expanded from anterior margin to basal third, then nearly parallel (feebly sinuate) to the posterior angles, which are acute; anterior margin nearly truncate, with only an obsolete median lobe; base bisinuate, with a very broad, moderately rounded median lobe; lateral margins rounded in front and feebly crenulate posteriorly; surface regularly convex, without transverse or longitudinal elevations, feebly impressed in front of scutellum, coarsely and irregularly punctate, the punctures deep, and becoming somewhat confluent toward the sides; intervals finely and densely granulose. Scutellum very small, transverse, and finely granulose. Elytra slightly wider than pronotum at base, feebly expanded behind the humeral angles, which are obtusely angulated, parallel to apical third, then arcuately attenuate to the tips, which are truncate and feebly emarginate; lateral margins entire, or at most, only obsoletely crenulate near humeral angles; surface striatopunctate, the striae feebly impressed, and the punctures rather coarse and distinctly separated, intervals feebly convex and obsoletely granulose, the striae and intervals are interrupted by numerous

¹⁵ Mon. Bupr., vol. 5, 1910, pp. 118-114.

small irregular depressions, which are finely, densely rugose, and sparsely clothed with short inconspicuous cinereous hairs, and more or less covered with pulverulence of the same color. Abdomen beneath coarsely and irregularly punctate, becoming feebly longitudinally rugose at the sides, and rather densely clothed with short recumbent cinereous hairs; first segment feebly longitudinally sulcate at middle; last segment at apex, broadly rounded in the female, subtruncate in the male. Prosternum strongly convex, not sulcate along the anterior margin, which is truncate, the surface rather densely and coarsely punctate and sparsely clothed with inconspicuous hairs; prosternal process broad, flat, and sparsely and very coarsely punctured at middle, with a deep marginal groove, which is sparsely, coarsely punctate, and sparsely clothed with a row of erect inconspicuous hairs, sides parallel to behind the anterior coxal cavities, then abruptly attenuate, and deeply arcuately emarginate to the apex, which is subtruncate, or feebly rounded.

Length, 22–28 mm.; width, 8.5–10.5 mm.

Castelnau and Gory (1837) described this species from St. Vincent, and it seems to be rare in collections. Material has been examined from the following localities. Coll. British Mus.: One specimen, Grand Ance, south end, Grenada; one specimen, Mustique Island, Grenadines (H. H. Smith); and another labeled Antilles, Trinidad (Fry Coll. 1905–100). Coll. U. S. Nat. Mus.: One specimen, Grenada, August 2. 1906 (R. D. Amstead, collector, Ballou No. 800).

This species is similar in shape to *aurata* Saunders, but can be readily distinguished from any other West Indian species of this genus by the uniform blue or bluish-green color above and by the absence of longitudinal and transverse smooth spaces on the pronotum.

PSILOPTERA (LAMPETIS) TORQUATA (Dalman)

Buprestis torquata DALMAN, Anal. Ent., 1832, p. 54.—JACQUELIN DUVAL, in Ramon de la Sagra's Hist. Phys. Polit. et Nat. de l'île de Cuba, Anim. Artic., 1857 (French Edition), p. 59; (Spanish Edition) vol. 7, 1857, p. 27.

Psiloptera torquata CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, *Buprestis*, p. 36, pl. 9, fig. 42.—CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 576 (separates p. 152).—GUNDLACH, Contribucion à la Entom. Cuba, vol. 3, pt. 5, 1891, p. 159.—KERREMANS, Mon. Bupr., vol. 5, 1910, pp. 55–56.

Buprestis aulica DEJEAN, Cat. Coleopt., 2 ed. 1833, p. 76; 3 ed. 1836, p. 86. (No description given.)

Form broadly elongate, attenuate and broadly rounded in front, and more acuminate posteriorly; head dark green; pronotum dark green, with two transverse arcuate impressions, which are densely covered with a golden-yellow pulverulence, one along the anterior

margin, rather broadly interrupted at the middle, the other near the base; scutellum bronzy-green; elytra with a longitudinal groove along the lateral margins, which is covered with a golden-yellow pulverulence similar to that on the pronotum, the reliefs dark green, and the depressions bronzy green margined with purple; beneath olive-green on the median parts, becoming purplish toward the sides.

Head nearly flat; surface strongly rugose, the reliefs rather broad, irregular, and densely granulate, the depressions filled with dense whitish pulverulence and sparsely clothed with rather long, erect hairs, which are more abundant along the eyes; epistoma broadly but not deeply arcuately emarginate in front, and with an obtuse tooth on each side of the emargination. Pronotum one and three-fourths times as wide as long, slightly narrower in front than behind, widest at base; sides broadly arcuately rounded from the anterior margin to near the base, then obliquely expanded to the posterior angles, which are acute; anterior margin arcuately emarginate, with a feebly rounded median lobe; base bisinuate, with a very large rounded median lobe; lateral margins more or less crenulate; surface with the transverse elevations densely granulose, becoming finely rugose toward the sides, and with coarse punctures in the depressions, which are covered by the pulverulence. Scutellum transversely oval and obsoletely granulated. Elytra wider than pronotum at base, arcuately expanded behind humeral angles, obsoletely attenuate to behind the middle, then more strongly arcuately attenuate to the tips, which are truncate and feebly emarginate; lateral margins coarsely crenulate near base, but entire posteriorly; humeral angles broadly rounded; surface striato-punctate, the striae interrupted at the sides and base, the punctures coarse and irregularly placed, and sparsely clothed with a few short recumbent hairs, the intervals feebly convex, and interrupted. Abdomen coarsely and sparsely punctate on the median parts (posterior margin of punctures not well defined), but becoming scabrous on the sides of the basal segment, sparsely clothed with long recumbent cinereous hairs on the median parts, the pubescence denser and mixed with a whitish pulverulence toward the sides; intervals finely and densely granulose; first segment rather broadly and deeply sulcate at middle; last segment broadly rounded at apex. Prosternum transversely concave along anterior margin, which is broadly truncate and obsoletely sinuate at middle, the surface coarsely rugose; prosternal process feebly convex, nearly smooth, with a deep marginal groove, which is rather densely punctate at bottom, and sparsely clothed with rather long erect hairs, the sides feebly expanded behind the anterior coxal cavities, then obliquely attenuate to the apex, which is broadly rounded.

Length, 16-27 mm.; width, 6-10 mm.

This species was described by Dalman (1832) from Cuba. Chevrolat (1867) records it from all parts of Cuba, in the collections of Gundlach, Poey, and Chevrolat. Gundlach (1891) records it as being distributed throughout the entire island of Cuba, and reports it taken a number of times on the stems of the "Icaco." Kerremans (1910) records it from Cuba and Jamaica, but the latter locality applies to the variety described in the present paper.

Material has been examined from the following localities: Coll. Amer. Mus. Nat. Hist.: Four specimens, labeled Santiago de Cuba, without additional data; one specimen, Santiago, Cuba, September 6, 1903 (Wirt Robinson); one specimen, Cienfuegos, Cuba (Dr. Eugenio Cuesta); and another one from Aguadores, on the coast near Santiago de Cuba, August 25, 1908 (Chas. T. Ramsden). Coll. Acad. Nat. Sci. Phila.: Two specimens, Cuba (Poey Coll. No. 12). Coll. British Museum: One specimen, Cuba (Coll. Chevrolat); and another one labeled simply Cuba. Coll. Carnegie Mus.: One specimen, Nueva Gerona, Isle of Pines, August 30, 1912. Coll. S. C. Bruner: One specimen, Cienaga de Zapata, Cuba, July 9, 1920. Coll. U. S. Nat. Mus.: Six specimens from Cayamas, Cuba, collected between December and May by E. A. Schwarz. There are also two specimens of this species labeled No. 2 in the Gundlach Museum in Habana, which have not been examined.

This seems to be the most common species of this genus found in the West Indies, and can be separated from all the other species from that region, except the variety *jamaicensis*, by the elytra having a distinct longitudinal groove along the lateral margins, which is usually filled with a dense yellowish pulverulence. From the variety it can be separated by the color.

PSILOPTERA (LAMPETIS) TORQUATA, var. JAMAICENSIS, new variety

Similar in shape and structure to *torquata*, but differs from it in the color. Elevations above brownish-black, with a feeble cupreous tinge when viewed in certain lights, and the depressed areas olive-green or aeneous; beneath olivaceous, with a strong cupreous reflection.

Length, 18–30 mm.; width, 6.5–12 mm.

Type locality.—Pallisadoes, Kingston, Jamaica.

Type, allotype, and paratypes.—Carnegie Museum.

Paratypes.—Cat. No. 26805, U.S.N.M. One paratype in British Museum.

This variety described from 9 specimens, four males and four females received the Carnegie Museum, which were collected at the type locality October 1898, and one male from the British Museum labeled Jamaica, without a definite locality.

After examining a large series of specimens from both Cuba and Jamaica, it seems advisable to separate the form found in Jamaica from the typical *torquata*, and give it a new varietal name.

PSILOPTERA (LAMPETIS) AURIFER (Olivier)

- Buprestis aurifer* OLIVIER, Entomol., vol. 2, gen. 32, 1790, pp. 13-14, pl. 9, fig. 95.—HERBST, Nat. Syst. Ins. Käfer, vol. 9, 1801, p. 185, pl. 140, fig. 7.
- Buprestis aurifera* FABRICIUS, Syst. Eleuth., vol. 2, 1801, p. 191.—SCHONHERR, Syn. Ins., vol. 1, pt. 3, 1817, p. 219.—JACQUELIN DUVAL, in Raimon de la Sagra's Hist. Phys. Polit. et Nat. de l'île de Cuba, Anim. Artic., 1857 (French Edition), p. 58; (Spanish Edition) vol. 7, 1857, p. 27.
- Psiloptera aurifera* CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, pp. 575-576 (separates pp. 151-152).—GUNDLACH, Contribucion à la Entom. Cuba, vol. 3, pt. 5, 1891, pp. 158-159.
- Psiloptera amethystipes* CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, *Buprestis*, p. 37, pl. 9, fig. 43.
- Psiloptera wurtembergi* MANNERHEIM, Bull. Soc. Imp. Nat. Moscou, vol. 10, No. 8, 1837, pp. 49-50.—DEJEAN, Cat. Coleopt., 2 ed. 1833, p. 76; 3 ed., 1836, p. 86.
- Psiloptera aurifer* KERREMANS, Mon. Bupr., vol. 5, 1910, pp. 57-58.

Form broadly elongate, attenuate and broadly rounded in front, and more acuminate posteriorly; head golden-green; pronotum dark green, with a strong purplish tinge, the depressions golden-green and arranged as follows: A longitudinal median one, broader posteriorly and feebly interrupted in front of middle, a rather broad one on each side along anterior margin, a narrow one along lateral margin but not reaching to the posterior angles, and a transversely oblique one behind the middle; scutellum and elytra dark green, with a strong purplish tinge, the latter without marginal grooves, but with numerous irregular transverse impressions, which are aureo-cupreous; beneath aeneo-viridis, with the reliefs of a beautiful violaceous color.

Head nearly flat, surface strongly, irregularly rugose on the median parts, the elevations broadly convex, smooth and shining on top, there is a rather wide even area along the margin of the eyes, which is densely, coarsely punctate, surface also densely clothed with long semi-erect hairs, and usually covered with a dense pale yellow pulverulence; epistoma broadly, but not deeply arcuately emarginate in front, and with an obtuse tooth on each side of the emargination. Pronotum one and three-fourths times as wide as long, slightly narrower in front than behind, middle and base about equal in width; sides feebly arcuately rounded from anterior margin to near base, then obliquely expanded to the posterior angles, which are acute; anterior margin arcuately emarginate, with a broadly rounded median lobe; base feebly bisinuate, with the median lobe very broad and feebly rounded; lateral margins strongly

crenulate to near the posterior angles; surface with the reliefs very finely granulose, with a few coarse irregularly placed punctures, the depressions coarsely and densely punctate, each puncture with a small round elevation, in the middle of which arises a short inconspicuous hair, the depressions are also usually covered with a pale yellow pulverulence. Scutellum transverse, more or less depressed at middle, and the surface densely granulose. Elytra wider than pronotum at base, strongly arcuately expanded behind the humeral angles, nearly parallel to near the apical third, then arcuately attenuate to the tips, which are truncate, and very feebly sinuate or emarginate; lateral margins very coarsely crenulate on the basal expanded parts, and entire posteriorly; humeral angles broadly rounded; surfaces striato-punctate, the striae feebly impressed, and the punctures coarse, shallow and remotely placed, intervals feebly convex and finely granulose, the striae and intervals interrupted by numerous transverse irregular depressions, which are coarsely and densely punctate, rather densely clothed with short inconspicuous hairs, and usually covered with a pulverulence similar to that on the pronotum. Abdomen beneath with numerous irregular flattened elevations, the depressions densely, coarsely punctate, somewhat rugose, and becoming strongly scabrous on the sides of the basal segment, the depressions are also rather densely clothed with long recumbent cinereous hairs, and the punctuation usually concealed by the dense pulverulence; first segment broadly and rather deeply longitudinally sulcate at middle; last segment at apex broadly rounded in female, and subtruncate and feebly sinuate in the male. Prosternum not transversely concave along anterior margin, which is truncate or very feebly emarginate at middle; surface sparsely and very coarsely punctate; prosternal process broad, feebly convex, smooth at middle, with a deep marginal groove, which is rather densely punctate and sparsely clothed with a row of long erect cinereous hairs, sides parallel to behind the anterior coxal cavities, then strongly attenuate, and arcuately emarginate to the apex, which is very broadly rounded.

Length, 17-27 mm.; width, 6-11mm.

Originally described by Olivier (1790) from a specimen which he believed was found at Cayenne, Guiana, and this locality was quoted by all of the older writers. The same species was also described from Haiti by Castelnau and Gory (1837) under the name *amethystipes*. Mannerheim (1837) described a species from Santo Domingo under the name *wurtembergi* and recorded it from *Cephalantho salicifolia*. Kerremans has placed this species as a synonym of *torquata* Dalman, but it is certainly not that species, but should be placed as a synonym of *aurifer* Olivier. Jacquelin

Duval (1857) records it from Santo Domingo and Cuba. Chevrolat (1867) also records it from Santo Domingo, in the collection of Chevrolat, and from Cuba in the collection of Dejean. Gundlach (1891) states that it is very doubtful from Cuba, but that it is found in Santo Domingo. Kerremans (1910) records it from Port au Prince, Haiti, in the Paris Museum, Brussels Museum, and the collections of Théry and Kerremans. This species is without any doubt confined to Santo Domingo, and the records given by Chevrolat and Jacquelin Duval of a specimen in the Dejean collection from Cuba, probably is based on *aulica*, which is a synonym of *torquata*, as Dejean never recorded a specimen in his collection under the name of *aurifer*.

Specimens have been examined from the following localities. Coll. British Mus.; One specimen, Antilles, Santo Domingo (Fry Coll.); one specimen St. Domingo (Parry, Saunders 74-18); and one specimen, Port au Prince, Haiti. Coll. Amer. Mus. Nat. Hist.: One specimen labeled simply Haiti (E. Lemke). Coll. U. S. Nat. Mus.: Two specimens, Port au Prince, Haiti (C. Bencomo, and W. L. Rockwell).

PSILOPTERA (LAMPETIS) AURATA (Saunders)

Psiloptera aurifera CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, *Buprestis*, p. 35, pl. 9, fig. 41. (Name preoccupied.)

Psiloptera aurata SAUNDERS, Catal. Bupr., 1871, p. 23.—KERREMANS, Mon. Bupr., vol. 5, 1910, pp. 56-57.

Form broadly elongate, attenuate and broadly rounded in front, and more acuminate posteriorly; head golden-green; pronotum black, with a slight bluish tinge, the depressions golden-green and arranged as follows: A deep longitudinal groove at middle, broader posteriorly and extending from the anterior margin to near the scutellum, a rather broad depression on each side along the anterior margin, a similar one along the lateral margin, becoming broader posteriorly, extending obliquely over the postero-lateral region, and forming two smooth oblique elevations on the disk; scutellum bluish-black; elytra without marginal grooves, aeneo-cupreous, sometimes becoming brownish or reddish-cupreous, and the intervals more or less bluish-black; beneath bluish-black, with a strong greenish or violaceous tinge, and the depressions aeneo-viridis.

Head nearly flat; surface strongly, irregularly rugose on the median parts, the elevations broadly convex, smooth and shining on the top, there is a rather wide area along the margin of the eyes, which is densely, coarsely punctate, densely clothed with long semi-erect hairs, and usually covered with a dense yellow pulverulence; epistoma broadly, but not deeply arcuately emarginate in front, and with an obtuse tooth on each side of the emargination. Pronotum

one and three-fourths times as wide as long, narrower in front than behind, middle and base about equal in width; sides broadly arcuately rounded from anterior margin to near base, then feebly obliquely expanded to the posterior angles, which are acute; anterior margin feebly arcuately emarginate, with the median lobe broadly rounded; base feebly bisinuate, with a very broad, feebly rounded median lobe; lateral margins very coarsely and irregularly crenulate to near the posterior angles; surface with the reliefs finely and densely granulose, and with a few very coarse irregularly placed punctures; the depressions coarsely and densely punctate, each puncture with a small round elevation, in the middle of which arises a short inconspicuous hair, the depressions are also usually covered with a dense pale yellow pulverulence, which obscures the punctuation. Scutellum transverse and densely granulose. Elytra slightly wider than pronotum at base, arcuately expanded behind the humeral angles, which are broadly rounded, parallel to just behind the middle, then arcuately attenuate to the tips, which are truncate and feebly sinuate or emarginate; lateral margins very coarsely and irregularly crenulate on the expanded basal parts, and entire posteriorly; surface striato-punctate, the striae feebly impressed, and the punctures dense and irregularly placed, the intervals obsoletely granulose and interrupted by numerous punctured areas, and becoming more or less rugose toward the sides. Abdomen beneath with numerous irregular flattened elevations, and the depressions densely, coarsely punctate, somewhat rugose, and becoming strongly scabrous on the sides of the basal segments, the depressions are also rather densely clothed with long recumbent cinerous hairs, and covered with a pale pulverulence; first segment broadly longitudinally sulcate at middle; last segment narrowly flattened at apex, broadly rounded in the female and subtruncate and feebly sinuate in the male. Prosternum not transversely concave along anterior margin, which is feebly arcuately emarginate at the middle, and forming an obtuse lobe on each side; surface sparsely and very coarsely punctate, and sparsely clothed with long recumbent hairs; prosternal process broad, feebly convex, and smooth at middle, with a deep marginal groove, which is rather densely punctate and sparsely clothed with a row of long erect cinereous hairs, sides parallel to behind the anterior coxal cavities, then strongly attenuate and arcuately emarginate to the apex, which is very broadly rounded.

Length, 17–25 mm.; width, 6–10 mm.

Castelnau and Gory (1837) originally described this species from Santo Domingo under the name *aurifera*. This name being pre-occupied by a species described by Oliver (1790) from Cayenne, French Guiana, Saunders (1871) proposed the name *aurata*. Ker-

remans (1910) records specimens from Haiti in the Paris Museum, Brussels Museum, and in the collection of Théry.

Specimens have been examined from the following localities, and from which the above description was made. Coll. Amer. Mus. Nat. Hist.: One specimen, labeled Haiti, without any definite locality. Coll. Mus. Comp. Zool.: One specimen, Grand Riviere, Haiti (W. M. Mann). Coll. British Mus.: One specimen, labeled Haiti (H. Deyrolle); and another, Haiti (Oberthur). U. S. Nat. Mus.: One specimen, Port au Prince, Haiti (Fry Coll. 1905-100) (Donated by the British Museum).

This species is closely allied to *aurifer* Olivier, but is more obliquely acuminate posteriorly, the reliefs on the pronotum are black, and not interrupted transversely by an oblique depression, the elytra aeneo-cupreous, and the striae and intervals not as distinctly interrupted by irregular transverse punctured areas.

PSILOPTERA (LAMPETIS) STRABA Chevrolat

Psiloptera straba CHEVROLAT, Ann. Ent. Soc. France, ser. 4, vol. 7, 1867, p. 575 (separates p. 151).—GUNDLACH, Contribution à la Entom. Cuba, vol. 3, pt. 5, 1891, p. 158, no. 1257.—KERREMANS, Mon. Bupr., vol. 5, 1910, pp. 58-59.

Form rather narrowly elongate, attenuate and broadly rounded in front, and strongly acuminate posteriorly; elytra without marginal grooves; above uniformly aeneo-cupreous, sometimes with a strong reddish tinge, the elytra ornated with numerous small depressions, which are densely covered with a whitish pulverulence; beneath aeneo-brunneus, with the median parts of a brilliant reddish-cupreous color.

Head feebly convex; occiput with a narrow longitudinal groove at the middle; surface strongly and very irregularly rugose, the elevations broadly convex, irregular in shape and size, covering the entire surface, and obsoletely granulose on the top, the depressions sparsely, coarsely and irregularly punctate, each puncture with a small round elevation at the middle, from which arises a rather long semi-erect cinereous hair; epistoma broadly and deeply arcuately emarginate at middle, the margin truncate on each side of the emargination. Pronotum one and one-half times as wide as long, slightly narrower in front than behind, widest at the middle; sides strongly arcuately rounded from the anterior margin to near base, then parallel or feebly obliquely expanded to the posterior angles, which are acute; anterior margin feebly arcuately emarginate, with an obsolete median lobe; base bisinuate, with a very broad moderately rounded lobe at middle; lateral margins rounded in front, and more or less crenulate posteriorly; surface more or less transversely concave at basal third, the concavity somewhat interrupted at the middle, and

with three broad smooth spaces arranged transversely, one at the middle, and one on each side, balance of surface coarsely, irregularly, and rather densely punctate, and usually covered with a white pulverulence. Scutellum small, slightly transverse and densely granulose. Elytra distinctly wider than pronotum at base, feebly expanded behind the humeral angles, which are broadly rounded, parallel to middle, then arcuately attenuate to the tips, which are truncate, and more or less deeply emarginate; lateral margins entire, or at the most, only obsoletely crenulate near humeral angles; surface striatopunctate, the striae more strongly impressed toward apex, the punctures coarse, well separated on basal parts, but becoming somewhat confluent posteriorly, intervals wide and nearly flat anteriorly, but becoming narrower and strongly convex toward the apex, and more or less transversely rugose laterally, the striae and intervals are interrupted by numerous small round depressions, irregularly situated, sparsely clothed with very short hairs, and densely covered with a white pulverulence. Abdomen beneath sparsely and irregularly punctate, the punctures coarse and more irregular in shape toward the sides, and feebly scabrous on the sides of the basal segment, rather densely but irregularly clothed with short recumbent cinereous hairs at the sides of the segments; first segment broadly longitudinally concave; last segment at apex broadly rounded in the female, subtruncate and feebly sinuate in the male. Prosternum feebly convex, sometimes with the anterior margin feebly elevated, truncate or slightly arcuately emarginate at middle, and with an obsolete lobe on each side; surface coarsely, rather densely punctate, and sparsely clothed with short semi-erect hairs; prosternal process broad, flat, and smooth at middle, with a deep marginal groove, which is coarsely, irregularly punctate, and sparsely clothed with a row of short hairs, sides parallel to behind the anterior coxal cavities, then strongly attenuate and feebly arcuately emarginate to the apex, which is broadly rounded.

Length, 22–32 mm.; width, 7–10.5 mm.

Described by Chevrolat (1867) from Cuba, where he records it as living on a species of pine in the western part of the island, specimens in the collections of Gundlach, Poey, and Chevrolat. Gundlach (1891) records it from Vuelta-Abaja, Cuba, where it was found on the leaves of a pine. I have seen specimens from the following localities. Coll. Amer. Mus. Nat. Hist.: One specimen, San Francisco, Isle of Pines, July 1, 1921, on *Ficus elastica* (Hall and Ballou); two specimens, 14 kilometers north of Vinales, Cuba, September 20, 1913, on pine, where most of the pines had been destroyed three years previously by a cyclone (C. W. Leng and F. E. Lutz). Coll. U. S. Nat. Mus.: One specimen, from Guantanamo, Cuba, March 1913 (Chas. T. Ramsden) (donated by the

Amer. Mus. Nat. Hist.). *Coh. Acad. Nat. Sci. Phila.*: One specimen, Cuba (Poey Coll. No. 1716). *Coll. Carnegie Mus.*: One specimen, Nueva Gerona, Isle of Pines, July 31, 1912. There is a single example of this species labeled No. 1257 in the Gundlach Museum in Habana, and another in the British Museum which have not been examined.

PSILOPTERA (LAMPETIS) BAHAMICA, new species

Gyascutus carolinensis WICKHAM (not Horn), *Canad. Entomol.*, vol. 27, 1895, p. 295.

Male.—Form rather broadly elongate, attenuate and broadly rounded in front, and more acuminate posteriorly; head cupreous; pronotum and elytra with the reliefs shining, bluish, purplish, cupreous or rubinous when viewed in different lights, the depressions olivaceous or aeneo-cupreous; elytra without marginal grooves; beneath aeneo-cupreous, with a slight bluish or purplish tinge.

Head nearly flat, occiput with a rather narrow smooth longitudinal carina at middle; surface strongly, irregularly rugose on the median parts, the elevations broadly convex, smooth and shining on the top, and very irregular in shape, there is a rather wide area along the margin of the eyes, which is densely and rather finely punctate, and densely clothed with long, semierect cinereous hairs, the punctures between the rugae deep, coarse, and from each one arises a rather long recumbent hair; epistoma broadly, but not deeply arcuately emarginate at the middle, and with an obtuse tooth on each side of the emargination. Pronotum one and three-fourths times as wide as long, slightly narrower in front than behind, middle and base about equal in width; sides feebly arcuately rounded from anterior margin to near base, then very feebly obliquely expanded to the posterior angles, which are acute; anterior margin feebly arcuately emarginate, with an obsolete median lobe; base bisinuate, with the median lobe very broad and feebly rounded; lateral margins coarsely and irregularly crenulate, except at the extreme posterior angles, where they are smooth and shining; disk with a broad, rather deep depression in front of the scutellum, in the bottom of which are two deep foveae; surface rather uneven, with a tendency of forming transverse smooth spaces, but these are more or less punctured and not distinct, coarsely and sparsely punctate, the punctures very irregularly situated, becoming somewhat confluent along anterior and lateral margins, and sparsely clothed with short inconspicuous hairs. Scutellum transverse, and finely granulose. Elytra slightly wider than pronotum at base, feebly arcuately expanded behind the humeral angles, which are broadly rounded, nearly parallel to behind the middle, then arcuately attenuate to the tips, which are truncate and feebly emarginate; lateral margins coarsely and irregularly crenulate

on the expanded basal parts, and entire posteriorly; surface striato-punctate, the striae feebly impressed and the punctures rather coarse anteriorly, but becoming finer toward the apex, intervals nearly flat on the basal region, but becoming more convex posteriorly, rather rugose toward the sides, and interrupted by numerous inconspicuous punctured spaces, and clothed with a few very short inconspicuous hairs. Abdomen beneath coarsely and rather densely punctate, the punctures becoming finer, denser and somewhat crenulate toward the sides, finely scabrous at the sides of basal segment, and rather densely clothed with moderately long recumbent hairs; first segment broadly longitudinally sulcate at the middle; last segment subtruncate and feebly sinuate at apex. Prosternum moderately convex, the anterior margin obsoletely arcuately emarginate in the middle, and forming an obsolete lobe on each side; surface sparsely, coarsely, and irregularly punctate, and somewhat rugose at the sides; prosternal process moderately broad, nearly flat, and smooth at the middle, with a deep marginal groove, which is coarsely punctate and sparsely clothed with a row of long hairs, sides parallel to behind the anterior coxal cavities, then strongly attenuate and feebly arcuately emarginate to the apex, which is obtusely rounded. Posterior coxae with an obtuse tooth on the posterior margin, situated closer to the legs than the lateral margin.

Female.—Similar to the male but slightly more robust, and the last abdominal segment broadly rounded at apex.

Length, 20–22 mm.; width, 6.5–8 mm.

Type locality.—Eleuthera, Bahamas.

Type and allotype.—Cat. No. 26806, U.S.N.M.

Paratype.—Coll. British Museum.

This species was described from three specimens, two males and one female, collected at the type locality, July 9, by Prof. H. F. Wickham.

It is allied to *aurata* Saunders and *aurifer* Olivier, but the pronotum not longitudinally sulcate at middle, and the transverse smooth spaces on disk not distinctly marked. This is the species recorded by Prof. H. F. Wickham in the Canadian Entomologist as *Gyascutus carolinensis* Horn.

Genus EUCHROMA Solier

Euchroma SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 284–286, pl. 11, fig. 14.—CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, pp. 5–7, pl. 1.—LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 20–21.—KERREMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 2, 1903, pp. 67–68; Mon. Bupr., vol. 3, 1908, pp. 245–250.

Head nearly flat or feebly convex, distinctly wider in front than at vertex; front longitudinally grooved, but not narrowed by the

insertion of the antennae; epistoma rather elongate and broadly emarginate in front; antennal cavities small, rounded, and situated a short distance from the inner margin of the eyes. Antennae short and robust; first joint rather short and enlarged at apex; second very short and obconical; third triangular and as long as the first; fourth to tenth triangular (outer joints wider than long), strongly dentate on the inner side, and armed with poriferous pores (which are more or less pubescent) on both sides of the joints; the eleventh joint emarginate at the apex. Eyes large, elliptical, strongly convex, and much closer to each other on the vertex than at the front. Pronotum wider than long, regularly convex, and without a median carina or sulcus. Scutellum small, suboval, and narrower in front than behind. Elytra elongate, strongly attenuate posteriorly; base sinuate and the lateral margins entire. Sternal cavity formed by the mesosternum and metasternum; mesosternum divided, the lateral branches long and feebly oblique; metasternum truncate in front, with a feeble arcuate emargination at the middle, and the surface broadly concave. Prosternum wide, strongly convex, with the anterior margin arcuately emarginate at middle; prosternal process broad, broadly flattened, with the sides declivous. Posterior coxae strongly dilated internally; anterior margin sinuate; posterior margin strongly oblique. Legs robust; femora subcylindrical, flattened, and feebly swollen at middle; tibiae cylindrical, feebly expanded at apex; tarsi depressed and rather broad, the first joint of the posterior pair a little longer than the following joint. Body elongate, very robust and rather strongly attenuate posteriorly.

This genus includes some of the largest Buprestids, and is very common throughout the Neotropical Region. Only one species is recognized, which is separated into a number of varieties according to the color and geographical distribution.

EUCHROMA GIGANTEA, var. HARPERI Sharp

Euchroma gigantea, var. *harperi* SHARP, TRANS. ENT. SOC. LONDON, 1881, pp. 289, 293-294.—KERREMANS, MON. BUPR., vol. 3, 1903, p. 249.

Euchroma gigantea FLEUTIAUX and SALLÉ, ANN. SOC. ENT. FRANCE, ser. 6, vol. 9, 1890, p. 405 (separates p. 55).

Male.—Form very large, robust, and moderately convex; above dark purplish-black to dark green, according to the direction in which the specimen is viewed; pronotum without discal spaces; beneath of the same color as above.

Head feebly convex; front with a broad, shallow longitudinal groove, which is interrupted on the vertex; occiput narrowly longitudinally sulcate, the sulcus terminating in a rather deep fovea on the top of the vertex; surface sparsely and finely punctate, the punc-

tures irregularly placed and becoming denser along the eyes, the intervals densely and obsoletely punctate; epistoma broadly arcuately, but feebly emarginate at middle, with a rather large obtuse tooth on each side of the emargination. Pronotum one and two-third times as wide as long, distinctly narrower in front than behind, widest near the middle; sides broadly arcuately rounded, the lateral margins strongly elevated posteriorly but becoming obsolete near the anterior margin, which is broadly arcuately emarginate; base feebly bisinuate, and the posterior angles obtusely angulated; surface regularly convex, polished and shining, densely and obsoletely punctate, with a number of deeper and larger punctures intermixed, the large punctures very sparse on the disk, but becoming denser toward the margins. Scutellum smooth. Elytra wider than pronotum at base, broadly rounded behind the humeral angles, strongly sinuate at the posterior coxae, behind which it is arcuately expanded to the apical third, then arcuately attenuate to the tips, which are narrowly and arcuately emarginate; each elytron with four more or less distinct longitudinal costae, and the intervals covered with vermicular reliefs. Abdomen beneath smooth and shining, with a few obsolete punctures, which are more abundant along the anterior margins of the segments; first segment feebly convex, without a median depression; fifth segment longer than the preceding one, and broadly, deeply, and angularly emarginate at the middle; last segment elongate, rather acuminate at apex, and very deeply and broadly depressed on each side of the median longitudinal elevation. Prosternum strongly convex, and abruptly declivous along the anterior margin, which is feebly arcuately emarginate at middle, and forming an obsolete lobe on each side of the emargination; prosternal process with the sides feebly dilated behind the anterior coxal cavities, then obliquely attenuate to the apex, which is obtusely rounded; surface densely and rather finely punctate, and densely clothed along the middle with a fine, erect pale pubescence (more or less rubbed off in some specimens), this is continued along the middle of the metasternum, where it diverges into two patches, which continue along the inner margin of the hind coxae and hind margin of the posterior femora.

Female.—Differs from the male in being nearly glabrous on the underside, the fifth ventral segment elongate, more than two times as long as the preceding one, strongly attenuate to the apex, which is feebly, broadly arcuately emarginate, and with the last segment only feebly visible; densely punctured, and with a small notch at the apex.

Length, 60–70 mm.; width, 25–28 mm.

This variety was described by Sharp (1881) from Georgetown, British Guiana, and its distribution extends from the type locality northward into the Antilles. Kerremans (1908) records it as distributed throughout all the Antilles, and Fleutiaux and Sallé (1890) record *gigantea* Linnaeus from Guadeloupe, which probably refers to this variety.

The following West Indian material has been examined: Coll. British Mus.: Two specimens, one labeled Guadeloupe (Tarnier) and the other Cuba (Heyne).

This form can be separated from the other varieties of this species by the uniformly dark color and the almost entirely absence of the discoidal spaces on the pronotum.

Genus PELECOSELAPHUS Solier

Pelecoselaphus SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 286-287, pl. 11, fig. 15.—CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, pp. 152-155, pls. 37-38.—LACORDAIRE, Gen. Col., vol. 4, 1857, p. 25.—KERREMANS, Wytman's Gen. Insectorum, fasc. 12, pt. 2, 1903, p. 58; Mon. Bupr., vol. 3, 1908, pp. 250-262, pl. 1.

Head distinctly and broadly depressed on front, and narrowly grooved on the occiput; front not narrowed by the insertion of the antennae, the sides obliquely converging to the vertex; epistoma arcuately emarginate in front, with the lateral angles of the emargination obtusely rounded; antennal cavities large, triangular, margined posteriorly by an elevated arcuate carina, and situated a short distance from the inner margin of the eyes. Antennae short; first joint elongate and moderately clavate; second short and subglobular; third two times as long as the second, and strongly expanded at apex; the following joints robust, wider than long, strongly dentate on the inner side, and both sides of the serrate joints armed with poriferous pores and foveae. Eyes large, elliptical, strongly convex, and much closer to each other on the vertex than at the front. Pronotum distinctly wider than long, narrower in front than behind, feebly convex, more or less sulcate on the disk, and declivous at the sides; anterior margin bisinuate, with the median lobe broadly rounded; base bisinuate, with a broadly rounded median lobe; sides obliquely expanded anteriorly, and broadly rounded posteriorly, the lateral margins smooth, sharply elevated, extending forward to the apical angles, where they are arcuately connected to the anterior margin. Scutellum small, wider than long, and subquadrangular. Elytra elongate, feebly lobed at base; sides arcuately attenuate to the apex, which is acuminate, the lateral margins strongly serrate posteriorly. Sternal cavity formed by the mesosternum and metasternum; mesosternum divided, the lateral branches rather short and broad; metasternum

truncate in front, with an arcuate emargination at the middle, and with a narrow longitudinal groove on the disk. Prosternum wide, and feebly convex; anterior margin truncate or arcuately emarginate, with the margin narrowly elevated; prosternal process very broad, flat or feebly convex, and not sulcate at the middle. Posterior coxae dilated internally; anterior and posterior margins sinuate. Legs slightly robust; anterior and middle femora feebly swollen at middle, the posterior pair subcylindrical, and flattened on both sides; anterior tibiae strongly carinate on the outer margin; tarsi compressed, the first joint of the posterior pair as long as the following two joints united. Body elongate, navicular, and acuminate at apex.

This is a small genus containing about nine described species, all of which are distributed from Mexico to South America, with the exception of one unrecognizable species, which has been recorded from the Antilles.

PELECOPSELAPHUS STRICTUS (Linnaeus)

Buprestis stricta LINNAEUS, Syst. Nat., 10 ed., 1758, p. 409, no. 4; Syst. Nat., 12 ed., vol. 1, pt. 2, 1767, p. 659, no. 4.—GMELIN, Linnaeus, Syst. Nat., 13 ed., vol. 1, pt. 4, 1788, p. 1929.

Pelecopocephalus stricta HOPE, Coleopterist's Manual, vol. 3, 1840, p. 52.

Pelecopselaphus stricta SAUNDERS, Catal. Bupr., 1871, p. 19.

Pelecopselaphus strictus KERREMANS, Mon. Bupr., vol. 3, 1908, p. 262.—LENG and MUTCHLER, Bull. Amer. Mus. Nat. Hist., vol. 37, 1917, p. 205.

The following is a copy of the very short original description given by Linnaeus:

B. elytris serratis sulcatis, tibiis angulatis, abdomine glabro. Habitat in Indiis.

Saunders (1871) lists the species from Brazil, Leng and Mutchler (1917) from the Antilles, and Kerremans (1908) records it from South America and the Antilles, saying that he has not seen the species, and also that it is the only Linnean species which he has not examined. Hope (1840) says that it is probably a *Pelecopocephalus* of Serville, and that Gmelin mentions the locality South America, as well as India, but he regards it as belonging to the former. Linnaeus (1758) in the original description gives "Indiis" as the locality, which may refer to either the East or West Indies, and not to India as stated by Gmelin.

The species is practically unknown, is unrecognizable from the short description, and the locality is also very questionable. It probably is a South American species and does not belong to the West Indian fauna, but is included in the present paper, since it has been recorded in the literature from the Antilles.

Genus *CHRYSESTHES* Solier

Chrysesthes SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 290-291, pl. 11, fig. 17.—LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 25-26.—KERMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 2, 1903, pp. 58-59; Mon. Bupr., vol. 3, 1908, pp. 262-270.

Head feebly depressed, distinctly wider in front than at vertex; front not narrowed by the insertion of the antennae, and sometimes longitudinally grooved; epistoma short and emarginate in front; antennal cavities small, rounded, margined posteriorly by an elevated carina, and situated near the inner margin of the eyes. Antennae short; first joint elongate, and strongly clavate; second very short and globular; third elongate, shorter than the first, subcylindrical, and feebly expanded at apex; following joints triangular, wider than long, robust, strongly dentate on the inner side, and the serrate joints armed with poriferous pores and foveae on both sides of the joints. Eyes large, strongly convex, broadly oblong, and much closer to each other on the vertex than on the front. Pronotum wider than long, attenuate anteriorly; disk feebly convex, and not longitudinally sulcate. Scutellum small, transverse or subrotundate. Elytra nearly truncate at base, strongly attenuate posteriorly, with the sides near apex strongly serrate. Sternal cavity formed by the mesosternum and metasternum; mesosternum divided, the lateral branches long and oblique; metasternum truncate in front, with a shallow arcuate emargination in front, and a narrow longitudinal groove on the disk at middle. Prosternum wide, feebly convex, anterior margin truncate, margined, and declivous near the eyes; prosternal process wide and not sulcate at middle. Posterior coxae dilated internally; anterior margin strongly sinuate, and the posterior margin straight. Legs slightly robust; anterior and median femora swollen at middle, the posterior pair subcylindrical and feebly flattened on both sides; tibiae slender, cylindrical, feebly enlarged at the apex, the anterior and middle pairs feebly arcuate, the former longitudinally carinate on the outer surface. Tarsi depressed, gradually triangularly enlarged, and flattened from the first to fourth joint; first joint of posterior pair nearly as long as the following two joints united. Body elongate, navicular and acuminate at apex.

This is a small genus, containing only five described species, which are confined in their distribution to the Neotropical Region, and of which, only one has been recorded from the West Indies.

CHRYSESTHES LANIERI (Chevrolat)

Buprestis (Chrysesthes) lanieri CHEVROLAT, Rev. Zool., 1838, p. 280.

Buprestis lanieri GORY, Mon. Bupr. Suppl., vol. 4, 1840, p. 123-124, pl. 21. fig. 121—JACQUELIN DUVAL, in Ramon de la Sagra's Hist. Phys. Polit. et Nat. de l'île de Cuba, Anim. Arctic, 1857 (French edition), p. 61, pl. 7, figs. 6-7; (Spanish edition), vol. 7, 1857, p. 28; vol. 8, pl. 7, figs. 6-7.

Pelecopselaphus lanieri CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1887, pp. 574-575, (separates pp. 150-151).—GUNDLACH, Contribucion à la Entom. Cuba, vol. 3, pt. 5, 1891, p. 157, No. 244.

Chrysesthes lanieri KERREMANS, Mon. Bupr., vol. 3, 1908, pp. 269-270.

Male.—Form rather narrowly elongate, navicular, feebly convex; above violaceous, with a strong greenish reflection; head and pronotum obsoletely margined with green; each elytron ornated with three round bright green impressions, one at the basal fourth, one at the middle, and the other near the apical third; beneath golden-green, more shining than above, and the abdominal segments broadly tinted with steel-blue along posterior margins; tarsi blue.

Head feebly transversely depressed behind the epistoma, with a longitudinal sulcus, which is deeply impressed on occiput and vertex, but becoming more obsolete on the front; surface more or less rugose, glabrous, coarsely but not very densely punctate, the punctures irregular in size and distribution, and bright green or ruby-red at the bottom; intervals coarsely and densely granulose; epistoma broadly and rather deeply arcuately emarginate in front, forming a large obtuse lobe on each side of the emargination. Antennae with the serrate joints armed with two large foveae on the under side, and a single obsolete one on the upper surface. Pronotum one and one-half times as wide as long, slightly narrower in front than behind; sides obliquely expanded from apical angles to near middle, then nearly parallel to the posterior angles, which are nearly rectangular; anterior margin nearly truncate; base slightly bisinuate, with the median lobe very broadly and feebly arcuately rounded; laterally the sides are sharply margined posteriorly, the margins smooth, arcuate, inflected in front, but not extending to the anterior margin; surface evenly convex, and not sulcate at middle, coarsely, transversely rugose, and finely and rather sparsely punctate, the punctures irregularly placed between the rugae, and of a bright ruby-red color at the bottom; reliefs finely and densely granulose. Scutellum transversely oblong, and obsoletely granulose. Elytra wider than pronotum at base, obliquely expanded behind the humeral angles, strongly sinuate at posterior coxae, then arcuately attenuate to the tips, which terminate in a short, acute tooth; lateral margins

coarsely and irregular serrate posteriorly; surface striato-punctate, the striae slightly impressed and the punctures fine, rather closely placed, ruby-red at bottom, and sometimes forming irregular double rows in the striae; intervals feebly convex, somewhat confused and transversely rugose toward the base, and the surface densely and obsoletely granulose; elytral foveae densely, coarsely granulose, with a few larger punctures intermixed. Abdomen beneath coarsely and irregularly punctate, the punctures very shallow, widely separated on the median parts, but becoming finer and much denser on the antero-lateral part of the segments, sparsely clothed with short inconspicuous hairs, the pubescence denser on the densely punctured areas; intervals densely obsoletely granulose; first segment feebly convex at middle; last segment broadly, deeply arcuately emarginate at apex, with a sharp acute tooth on each side of the emargination. Prosternum coarsely and rather densely punctate, densely clothed with rather long erect inconspicuous hairs, and with the intervals finely and densely granulose; prosternal process feebly convex, strongly expanded behind the anterior coxal cavities, then strongly attenuate and arcuately emarginate to the apex, which is broadly and feebly rounded.

Female.—No specimens have been examined of this sex, but the last abdominal segment is recorded as being more truncate at apex, and the lateral teeth not as strongly produced.

Length, 16–18 mm.; width, 5.5–6 mm.

Originally described by Chevrolat (1838) from Cuba. Jacquelin Duval (1857), and Chevrolat (1867) both record it from Cuba, in the collections of Gundlach, Poey and Chevrolat, and state that the larvae live in the royal palm. Gundlach (1891) records collecting it at Cardenas, Cuba. Gory (1840) also records it from Cuba, and states that Chevrolat reports the larvae of this Buprestid living in the "ecorce" of the royal palm (*Oreodoxa regia*), (which had been cut down) at a place six leagues northeast of the Bay of Jagua, on the south side of Cuba, near a small stream. He collected about 20 examples during May, which were fully matured and ready to emerge.

Material has been examined from the following localities. Coll. Acad. Nat. Sci. Philad.: One specimen, labeled Cuba (Poey Coll. No. 798). Coll. British Mus.: One specimen, without locality and simply labeled Saunders 74–18. Coll. U. S. Nat. Mus.: One specimen received from S. C. Bruner, collected at Camaguey, Cuba, August 10, 1921 (Angelica Rieto); and one specimen labeled Cuba (Poey Coll. No. 798) (donated by the Acad. Nat. Sci. Philad.). There is a single example labeled *Peleopselaphus lanieri* No. 244 in the Gundlach Museum in Habana, but has not been examined by the writer.

Genus HILAROTES Thomson

Hilarotes SAUNDERS, Catal. Bupr., 1871, p. 21.—THOMSON, Typ. Bupr., 1878, pp. 39-40.—KERREMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 2, 1908, p. 89; Mon. Bupr., vol. 3, 1909, pp. 425-429.

Head regularly arcuate, and feebly convex, slightly wider in front than at vertex; front not narrowed by the insertion of the antennae, and more or less rugose; occiput with a narrow longitudinal groove; epistoma transversely truncate; antennal cavities small, rounded, margined posteriorly by an obtuse elevation, and situated near the anterior margin of epistoma and also rather close to the inner margin of the eyes. Antennae short; first joint elongate, and feebly clavate; second very short, obconical; third slender, elongate and feebly triangular; fourth about equal in length to the third, but broader at the apex; the following joints feebly triangular and becoming gradually shorter toward the last joint, and armed with the poriferous pores on both sides of the joints, and with a small fovea on the under side near the anterior apical angle. Eyes rather large, elliptical, feebly convex, and slightly closer to each other on the vertex than at the front. Pronotum wider than long, moderately convex, and the disk with three longitudinal impressions; base feebly sinuate. Scutellum small and rounded. Elytra moderately convex, nearly truncate at base, attenuate posteriorly, sides with a single tooth near apex. Sternal cavity formed by the mesosternum and metasternum; mesosternum divided, the lateral branches rather long and oblique; metasternum truncate in front, with a deep arcuate groove on the disk. Prosternum feebly convex, the anterior margin arcuately emarginate and strongly elevated; prosternal process wide, feebly convex, and not sulcate at middle. Posterior coxae strongly dilated internally; anterior margin strongly sinuate; posterior margin oblique, usually with a large obtuse tooth near the middle, but sometimes obsolete. Legs slender, anterior and middle femora slightly swollen at middle, the posterior pair subcylindrical and feebly flattened on both sides; tibiae slender and cylindrical; tarsi depressed, the first joint of the posterior pair nearly as long as the following two joints united. First abdominal segment nearly as long as the following three segments united, and more or less concave at the middle. Body elongate, attenuate in front, and more acuminate posteriorly.

This name was first used by Saunders (1871) for two species, *mannerheimi* Mannerheim, and *chalcoptera* Jacquelin Duval without giving any description, but Thomson (1878) gives a description of the genus under the same name, in which he includes both of the species listed by Saunders. At present the genus includes three species, two of which have been described from Haiti, and the other from Cuba.

The genus is very closely allied to *Halecia*, and Kerremans separates it from that genus by the posterior margin of the hind coxae strongly toothed at the middle, but this character is variable, and in *chalcoptera* is nearly obsolete. All the species of *Hilarotes* can be separated from the species of *Halecia* found in the West Indies, by the lateral margin of the elytra armed with a single strong tooth near the apex.

KEY TO THE SPECIES

1. Sides of pronotum nearly parallel posteriorly, not distinctly wider at base than at middle; color above auro-viridis.
 ----- *nitidicollis* (Castelnau and Gory).
 Sides of pronotum distinctly narrower in front than behind, and widest at base ----- 2.
2. Pronotum and elytra unicolored, aeneo-viridis. *mannerheimi* (Mannerheim).
 Pronotum and elytra bicolored; pronotum aeneo-viridis, sometimes with a bluish reflection; elytra aeneo-cupreous. *chalcoptera* (Jacquelin Duval).

HILAROTES NITIDICOLLIS (Castelnau and Gory)

Halecia nitidicollis CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, pp. 110-111, pl. 28, fig. 151.

Hilarotes nitidicollis KERREMANS, Mon. Bupr., vol. 3, 1909, pp. 427-428.

Petloptera aureomicans NONFRIED, Deutsch. Entomol. Zeitschr., 1891, p. 272.

Form broadly elongate and feebly convex; above shining, uniformly auro-viridis; beneath auro-viridis, with a strong cupreous tinge, tibiae bluish-green, and the tarsi cyaneous.

Head feebly convex and without depressions on the front, but with a narrow longitudinal groove on the vertex and occiput; surface coarsely and deeply punctate, the punctures irregularly placed and confluent in some areas, the reliefs smooth and somewhat rugose; epistoma transversely truncate in front; antenna bluish-green. Pronotum one and one-half times as wide as long, slightly narrower in front than behind, widest near the middle; sides subangularly arcuate, obliquely narrowed in front, dilated in front of middle, nearly parallel posteriorly, and sinuate near the posterior angles, which are nearly rectangular, the lateral margins rounded and strongly rugose, with a very short smooth carina at the base; anterior margin rather deeply arcuately emarginate, with a broadly rounded median lobe; base feebly sinuate and obtusely angulated at the middle; disk strongly convex, with a broad longitudinal median sulcus, which is more or less interrupted at the middle and forming a deep fovea in front of the scutellum, and also on each side a short narrow longitudinal depression, deeper at the base, and extending to near the

middle, surface very coarsely and deeply punctate, the punctures irregularly placed, and becoming somewhat confluent toward the sides; intervals smooth and shining. Scutellum rounded, the surface finely and densely granulose. Elytra distinctly wider than pronotum at base, strongly obliquely expanded behind the humeral angles, nearly parallel to behind the middle, then strongly arcuately attenuate to the tips, which are obtusely rounded and bidentate, the lateral margins with a large tooth near apex; surface with the basal depression transverse and rather deep, striato-punctate, the striae feebly impressed, regular on the disk, but becoming more irregular toward the sides, where the surface is more or less transversely rugose, the punctures rather deep, somewhat confluent and irregularly placed in the striae, the intervals feebly convex and nearly smooth. Abdomen beneath very sparsely and rather coarsely punctate, from each puncture arises a short, erect cinereous hair; intervals smooth and shining; first segment broadly and feebly concave at middle; last segment broadly rounded and feebly subtruncate at apex. Prosternum convex, the anterior margin broadly arcuately emarginate at middle, with an obsolete lobe on each side, and the margin strongly elevated; surface sparsely and very coarsely punctate, and clothed with a few long inconspicuous hairs; prosternal process feebly convex, nearly smooth, and not sulcate at middle; sides feebly expanded behind the anterior coxal cavities, then obliquely attenuate to the apex, which is acutely rounded.

Length, 19 mm.; width, 7.5 mm.

This species was described by Castelnau and Gory (1838) from a specimen in the Buquet Collection from Santo Domingo, and Nonfried (1891) described the same species from Haiti under the name *Psiloptera aureomicans*. Kerremans (1909) records it from Haiti in the Paris Museum and also in the collections of Théry and Kerremans. It seems to be rare in collections and confined to the island of Haiti. Through the kindness of the British Museum I have been able to examine two specimens, one labeled Port-au-Prince, Haiti, and the other simply Haiti (Obenthur), both of these specimens are also labeled *aureomicans* Nonfried, and later determined by Kerremans as *nitidicollis* Castelnau and Gory. (One of these specimens has been donated to the U. S. Nat. Mus.)

Kerremans¹⁶ has placed *chalcoptera* Jacquelin Duval as a synonym of this species, but it is quite distinct from *nitidicollis* and is confined to the island of Cuba.

¹⁶ Mon. Bupr., vol. 3, 1909, p. 427.

HILAROTES MANNERHEIMI (Mannerheim)

Ancylocheira mannerheimii DEJEAN, Cat. Coleopt., 2 ed., 1833, p. 78; 3 ed., 1836, p. 88. (No description).

Buprestis mannerheimii MANNERHEIM, Bull. Soc. Imp. Nat. Moscou, vol. 10, no. 8, 1837, pp. 66-67.—GORY, Mon. Bupr., Suppl., vol. 4, 1840, pp. 121-122, pl. 21, fig. 119.

Hilarotes mannerheimi KERREMANS, Mon. Bupr., vol. 3, 1909, pp. 428-429.

Buprestis inaequalis MANNERHEIM (in litt.).

The following is a translation of Mannerheim's original description:

Greenish-bronzy, antennae black; femora violaceous at tip; head rugosely punctate; thorax dilated at base; above uneven, deeply canaliculate and rugosely punctate; elytra striate, uneven, the interstice punctate, and the alternate ones feebly elevated.

Var. *b*. Violaceous-aeneous, marked with greenish-bronzy; elytra greenish-bronzy lineate; legs greenish-bronzy, the femora at apex and tarsi violaceous.

Island St. Domingo, collected by Mr. Jaeger.

Length, 8 lines; width, 3 lines.

Head strongly rugosely punctate, front deplanate. Antennae black, and slightly shorter than the head and thorax. Thorax scarcely longer than the width in front, and at the base almost two times wider, and here as at the apex bisinuate; sides feebly constricted behind the middle, and thence dilated, posterior angles acute and rather prominent; above deeply rugosely punctate, very uneven, and throughout the entire length deeply and broadly canaliculate. Scutellum small, orbicular, and smooth. Elytra at base much broader than thorax, nearly four times as long as the thorax, and gradually attenuate posteriorly; apex subemarginate, and dentate on the inside; sides margined, the margin ending in an acute tooth a little before the apex; above very uneven, at the humeri deeply foveate, striate; interstice irregularly punctate, the alternate ones feebly elevated. Body beneath and legs deeply punctate, the punctures here and there rugose.

This name was first used by Dejean (1833) for a specimen in his collection from Santo Domingo under the name *inaequalis* Mannerheim, (which was a manuscript name) without giving a description of the species. Mannerheim (1837) described the species, using the same name as listed in the Dejean Catalogue. The species is very rare in collection, as Gory made his figure from the specimen in the Dejean Collection, and the species was unknown to Kerremans. No specimens have been seen which agree with the description, and the species is included in the key from the characters given in the original description.

HILAROTES CHALCOPTERA (Jacquelin Duval)

Buprestis chalcoptera JACQUELIN DUVAL, in Ramon de la Sagra's Hist. Phys. Polit. et Nat. de l'île de Cuba, Anim. Artic., 1857 (French Edition), pp. 59-60; (Spanish Edition), vol. 7, 1857, p. 27.—CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1887, p. 578 (separates p. 154).—GUNDLACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, 1891, pp. 161-162, No. 308.

Form rather broadly elongate, feebly convex, and shining above; head and pronotum aeneo-viridis, sometimes with a bluish reflection; scutellum and elytra aeneo-cupreous; beneath dark green, with a strong violaceous tinge.

Head nearly flat, and without any depressions on the front, but with a narrow longitudinal groove on the vertex and occiput; surface not rugose, but coarsely, deeply and rather sparsely punctate, the punctures well separated and irregularly placed; intervals smooth; epistoma broadly truncate in front; antennae aeneo-brunneous, the basal joints green, with the first joint testaceous at base. Pronotum about one and one-half times as wide as long, distinctly narrower in front than behind, widest at base; sides feebly obliquely expanded from apex to basal fourth, then abruptly and obliquely expanded to the posterior angles, which are rather acute; anterior margin arcuately emarginate, with an obtusely angulated lobe at the middle; base transversely truncate to middle of elytron, and with a broadly rounded median lobe, which is arcuately emarginate in front of scutellum; lateral margins rounded and smooth anteriorly, with a short smooth carina at the base; disk with a broad longitudinal sulcus, which is more deeply impressed near the scutellum, a broad obsolete one on each side, extending from the base to near the middle, and a deep narrow one along the anterior margin, broadly interrupted at the middle, these depressions causing a broadly rounded gibbosity near the posterior angles; surface coarsely, sparsely and irregularly punctate, and very sparsely clothed with short inconspicuous hairs, the intervals irregular in size and finely and obsoletely punctured. Scutellum rounded or transversely oblong, slightly more acutely rounded posteriorly, with the surface nearly smooth. Elytra distinctly wider than pronotum at base, broadly arcuately expanded behind the humeral angles, nearly parallel to behind the middle, then strongly arcuately attenuate to the tips, which are obtusely rounded and bidentate, the lateral margins with a large tooth near the apex; disk with a broad irregular basal depression; surface striato-punctate, the striae feebly impressed, regular on the disk, but becoming more irregular and somewhat confused at the sides, the punctures in the striae fine, remotely and rather regularly spaced, some of the intervals more strongly convex, especially toward the apex, and sparsely, irregularly punctate, from each puncture arises a short in-

conspicuous hair, which is more erect than those in the striate. Abdomen beneath coarsely and rather densely punctate, and sparsely clothed with rather long recumbent hairs, with a few denser pubescent areas at the antero-lateral part of the segments; first segment convex, without a median sulcus; last segment broadly truncate at apex. Prosternum convex, the anterior margin feebly arcuately emarginate, and feebly declivous, the surface coarsely and rather densely punctate and sparsely clothed with short erect inconspicuous hairs; prosternal process nearly flat, rather densely punctured, and not sulcate at the middle, the sides parallel to behind the anterior coxal cavities, then obliquely attenuate to the apex, which is acutely rounded. Posterior coxae with the median tooth on posterior margin only feebly developed.

Length, 15–17 mm.; width 5.5–6.5 mm.

This species was described by Jacquelin Duval (1857) from Cuba, and its distribution is probably confined to that island. Chevrolat (1867) records it from Cuba, in the collections of Gundlach and Poey. Gundlach (1891) reports collecting it in the western part of Cuba.

Through the kindness of the Academy of Natural Sciences, Philadelphia, I have been able to examine two specimens from their collection labeled Cuba (Poey Coll. No. 14), from which the above description was made, and which are probably the specimens referred to by Chevrolat. The specimens are probably both females. (One of these specimens has been donated to the U. S. Nat. Mus.) There is also a single example of this species labeled No. 308 in the Gundlach Museum in Habana, and another one in the British Museum, which have not been examined.

Kerremans has placed this as a synonym of *nitidicollis* Castelnau and Gory, but it is a distinct species. The elytra are aeneo-cupreous and more finely punctured, pronotum distinctly narrower in front than behind, and widest at base, the surface more finely punctured and the longitudinal depressions on each side of the middle more obsolete, prosternum more densely punctured, the anterior margin declivous, and not elevated, and the underside of the body green, with a violaceous tinge.

Genus *CHALCOPHORA* Solier

Chalcophora SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 278–279, pl. 10, fig. 9.—CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, *Ruprestis*, pp. 7–19, pls. 2–4.—LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 21–22.—KERREMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 2, 1903, pp. 77–78.—CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, pp. 77–78.—KERREMANS, Mon. Bupr., vol. 4, 1909, pp. 17–49, pl. 23.

Head more or less rugose, longitudinally impressed at the middle, and slightly wider in front than at vertex; front not narrowed by

the insertion of the antennae; epistoma short and arcuately emarginate in front; antennal cavities large, deep, rounded, and situated about equally distant between the anterior margin of epistoma and the inner margin of the eyes. Antennae rather robust, and nearly as long as the head and pronotum united; first joint moderately elongate and strongly clavate at apex; second very short and globular; third slightly shorter than the first, but more slender and cylindrical; following joints longer than wide, more obtusely dentate on the inner side, and becoming gradually shorter to the eleventh joint, which is oblong, the serrate joints armed with poriferous pores on both sides of the joints, but without distinct foveae. Eyes not very large, moderately convex, broadly oblong, and only slightly closer to each other on the vertex than at the front. Pronotum wider than long, moderately convex, and longitudinally sulcate or carinate at the middle; base bisinuate. Scutellum very small and nearly quadrate. Elytra elongate, sinuate at base, moderately convex, and strongly attenuate posteriorly; lateral margins more or less serrate posteriorly. Sternal cavity formed by the mesosternum and metasternum; mesosternum divided, the lateral branches long and oblique; metasternum feebly rounded in front and with a narrow longitudinal groove at the middle. Prosternum feebly convex; anterior margin sinuate and feebly produced at middle; prosternal process wide, flat, and with two longitudinal sulci. Posterior coxae strongly dilated internally; anterior margin sinuate; posterior margin strongly oblique. Legs rather robust; anterior and middle femora strongly swollen at middle, the posterior pair subcylindrical; tibiae subcylindrical, feebly enlarged at the apex, and the anterior pair with a longitudinal carina on the exterior margin; tarsi depressed, elongate, the first joint of the posterior pair as long as the following two joints united. First abdominal segment concave or sulcate at middle. Body robust, elongate-oval, attenuate in front, and more acuminate behind.

This genus is distributed throughout the Nearctic and Palaearctic Regions, and includes about 20 described species, of which only two have been recorded from the West Indies. One of these was originally described from Guadeloupe, and the other was introduced into Cuba, probably in pine timber from the United States. The species are closely allied, but the following table, which is taken from Kerremans Monograph, may be of some assistance in separating the two species.

KEY TO THE SPECIES

Elytra with the subsutural groove entire, attaining the base, though shallow and sometimes partially interrupted near the base; color above reddish-cupreous; sulcus on first abdominal segment pubescent, more distinctly in the male_____ *humboldtii* (Castelnau and Gory).

Elytra with the subsutural groove abbreviated in front, and only attaining the basal third or fourth; color above aeneo-nigris; sulcus on first abdominal segment glabrous in both sexes..... *virginiensis* (Drury).

CHALCOPHORA HUMBERTI (Castelnau and Gory)

Buprestis humboldti CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, p. 12, pl. 3, fig. 8.

Chalcophora humboldti FLEUTIAUX and SALLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, 1890, p. 403 (separates p. 53).—KERREMANS, Mon. Bupr., vol. 4, 1909, p. 85.

The following is a translation of Castelnau and Gory's original description:

Reddish-cupreous and elongate, thorax strongly granulose; surface with elevated lines; elytra nearly smooth, with longitudinal costae and cupreous impressions. Length, $9\frac{1}{2}$ lines; width, $3\frac{1}{2}$ lines. Habitat Guadeloupe.

Body elongate and of a golden-coppery color. Head and thorax granulose, with a few smooth longitudinal lines, the latter nearly quadrate. Elytra nearly smooth at middle, with feeble longitudinal costae at the sides, the costae interrupted by two depressions. Body beneath golden-yellow, and granulose, the abdominal segments feebly impressed on each side.

Fleutiaux and Sallé (1890), and Kerremans (1909) both record this species from the type locality, probably only from the record given in the original description, since neither of these authors had examined specimens of it. No specimens of this species have been seen by the writer.

CHALCOPHORA VIRGINIENSIS (Drury)

Buprestis virginiensis DRURY, Illustr. Nat. Hist., Exotic Ins., vol. 1, 1770, pp. 66-67, pl. 30, fig. 3.—HERBST, Nat. Syst. Ins. Käfer, vol. 9, 1801, pp. 114-116, pl. 148, fig. 1.—SCHONHEER, Syn. Ins., vol. 1, pt. 3, 1817, p. 230.—CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, pp. 11-12, pl. 2, fig. 7.

Chalcophora virginiensis WATERHOUSE, Biol. Centr.-Amer., Coleopt., vol. 3, pt. 1, 1882, p. 2; 1889, p. 167.—KERREMANS, Mon. Bupr., vol. 4, 1909, pp. 26-29.

Buprestis virginica GMELIN, Linnaeus, Syst. Nat., 13 ed., vol. 1, pt. 4, 1788, p. 1940, No. 110.

Buprestis cupreomaculatus GOEZE, Entom. Beitr., vol. 1, 1777, p. 596, No. 11.

Chalcophora novaeboracensis FITCH, Trans. N. Y. State Agri. Soc., vol. 17, 1858, pp. 701-702, No. 220.

Chalcophora virginica CHEVOLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1897, p. 573 (separates p. 149).—GUNDLACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, 1891, pp. 155-156.

Rather broadly elongate, rounded in front, slightly more attenuate behind, and moderately convex above; above aeneo or aeneo-cupreous in the depressions, with the reliefs brownish-black; beneath more reddish-cupreous and shining than above.

Head feebly convex, with a broad, deep longitudinal depression on the front, which is rather broadly and deeply sulcate at the middle, the sulcus becoming narrow and feebly impressed on the occiput; surface sparsely, coarsely and very irregularly punctate, the punctures variable in size, but becoming denser and finer along the margins of the eyes, also sparsely clothed with short cinereous hairs, especially along the eyes; epistoma broadly and very deeply arcuately emarginate in front, forming an obtuse tooth on each side of the emargination. Pronotum slightly more than one and one-half times as wide as long, slightly narrower in front than behind, widest near apical third; sides arcuately expanded to near the apical third, where they are broadly rounded or feebly angulated, then very feebly narrowed or parallel to the posterior angles, which are nearly rectangular; anterior margin arcuately emarginate, with an obsolete broadly rounded median lobe; base bisinuate, with the median lobe broadly rounded; surface with numerous irregular variable depressions at the sides and with two rather shallow longitudinal sulci at the middle, densely and irregularly punctate in the depression, the punctures irregular in size and shape, and becoming confluent at some places, the intervals finely, densely granulose, and with a few large remotely placed punctures. Scutellum very small and rounded. Elytra moderately convex, slightly wider than the pronotum at base; humeral angles obtusely angulated; sides broadly arcuately expanded behind the humeral angles, sinuate at the posterior coxae, then arcuately attenuate to the tips, which are rather acutely rounded, with a short acute tooth at the sutural margin, the lateral margins feebly serrate posteriorly. Each elytron with four more or less distinct longitudinal costae; the first rather broad, entire, extending along the suture and strongly expanded anteriorly, where it is connected to the suture and second costa; second costa formed by a series of four broad irregular reliefs, sometimes connected to each other by a slender smooth elevated line, and the two posterior reliefs connected to the first costa; third costa narrow, beginning at the humeral callosity and extending into a broad relief, situated midway between the third and fourth reliefs of the second costa, and connected to the fourth costa; fourth costa very narrow, not interrupted, without broader reliefs, extending from the humeral callosity to near the apex, and following the outline of the lateral margin; the reliefs smooth, with a few scattered fine punctures; depressions finely and densely punctate, the punctures becoming more or less confluent, and finely rugose. Abdomen beneath finely and very irregularly punctate, in some areas the punctures are more or less longitudinally confluent, sparsely clothed with moderately long, fine, cinereous hairs, and the intervals smooth and shining; first segment broadly but feebly longitudinally sulcate at middle; last segment

broadly, deeply arcuately emarginate at apex in the male, and acutely rounded in the female. Prosternum feebly convex, the surface sparsely and coarsely punctate, becoming coarsely rugose at the sides, sparsely clothed with long inconspicuous hairs; anterior margin nearly truncate in front; prosternal process nearly flat, the surface smooth, with a double row of irregularly placed coarse punctures, from which arises a series of rather long hairs, and which are more distinct in the male than in the female, the sides expanded behind the anterior coxal cavities, then arcuately emarginate and narrowed to the apex, which is rather narrowly rounded.

Length, 20–29 mm.; width, 6.5–10 mm.

This species was originally described by Drury from Virginia. It is a very common insect and the larvae infest various species of pines. It is distributed over the entire eastern part of the United States, and extends southward into Mexico and Central America. I have not seen any specimens from the West Indies, so the above description was made from a specimen collected in Virginia. Chevrolat (1867) records a single specimen having been collected in Cuba, which was probably imported from the United States. Gundlach (1891) states that it is not indigenous to Cuba, but has been introduced in ships from North America.

Genus *HALECIA* Castelnau and Gory

Pristiptera DEJEAN, Cat. Coleopt., 2 ed., 1833, p. 78; 3 ed., 1836, p. 88.

Prionophora DEJEAN, Cat. Coleopt., 2 ed., 1833, p. 78; 3 ed., 1836, p. 89.

(No described species included.)

Leptia (part) DEJEAN, Cat. Coleopt., 2 ed., 1833, p. 78; 3 ed., 1836, p. 89.

(No described species included.)

Halecia CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, pp.

108–114.—LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 23–25.—KERREMANS,

Wytsman's Gen. Insectorum, fasc. 12, pt. 2, 1903, pp. 69–71; Mon.

Bupr., vol. 3, 1908–1909, pp. 336–425, pls. 20–21.

Acantha CASTELNAU and GORY, Mon. Bupr., vol. 1, 1838, pp. 1–3, pl. 1.

Head more or less depressed, distinctly wider in front than on vertex; front not narrowed by the insertion of the antennae, and sometimes feebly longitudinally grooved; epistoma emarginate in front; antennal cavities small, rounded, and situated under an elevated carina at a considerable distance from the inner margin of the eyes. Antennae short; first joint elongate and feebly clavate at apex; second short, obconic; third elongate, nearly as long as first joint, and feebly triangular; fourth nearly as long as third, but broader at apex; following joints triangular, slightly longer than wide, dentate on the inner side, except the last joint, which is oblong; the last eight joints armed with poriferous pores, and more or less distinct foveae on both sides of the joints. Eyes large, strongly convex, broadly oblong, and distinctly closer to each other on the

vertex than at the front. Pronotum wider than long, usually narrower in front than behind; base bisinuate; disk feebly convex and more or less sulcate. Scutellum small and transverse. Elytra rather convex, feebly lobed at base, and strongly attenuate posteriorly; lateral margins smooth or serrate posteriorly. Sternal cavity formed by the mesosternum and metasternum; mesosternum divided, the lateral branches rather long and oblique; metasternum truncate in front, with a shallow arcuate emargination at the middle, and a narrow longitudinal groove on the disk. Prosternum convex, anterior margin truncate or arcuately emarginate; prosternal process rather wide, feebly convex, and not sulcate at middle. Posterior coxae slightly dilated internally; anterior margin feebly sinuate; posterior margin slightly oblique. Legs slightly robust; anterior and middle femora strongly swollen at middle, the posterior pair subcylindrical; tibiae slender and subcylindrical; tarsi broad and depressed, the first joint of posterior pair as long as the following two joints united. Body rather robust, elongate, attenuate in front, expanded posteriorly, and attenuate or acuminate at apex.

The species of this genus are rather numerous in numbers, and are distributed throughout the Neotropical Region. Four species have been recorded from the West Indies, of which, only one has been seen by the writer. *Pristiptera* was used by Dejean (1833) for four species, three of which were undescribed, and the fourth being *blanda* described by Fabricius from Brazil.

The characters used in the following key are the same as those used by Kerremans for separating the species of this genus.

KEY TO THE SPECIES

1. Lateral margin of the elytra dentate posteriorly----- *verecunda* Chevrolat.
Lateral margin of the elytra not dentate posteriorly----- 2.
2. Tibiæ cyaneo-purpureis; tarsi blackish----- *quadricolor* Chevrolat.
Tibiæ and tarsi ferrugineous or testaceous----- 3.
3. Elytra bronzy-green, with purplish reflection----- *erythropus* (Gory).
Elytra golden-green, with a bluish reflection----- *pyropus* Kerremans.

HALECTIA VERECUNDA Chevrolat

Halectia verecunda CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, pp. 573-574 (separates pp. 149-150).—GUNDLACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, 1891, pp. 156-157, No. 792.—KERREMANS, Mon. Bupr., vol. 3, 1908, p. 346.

The following is a translation of Chevrolat's original description:

Elongate, gradually attenuate from behind to apex, opaque and blackish-green; head punctate, rounded, longitudinally sulcate and red, front and sides green; antennae black, the third joint nearly as long as the first; eyes fuscous, large, and oblong; thorax moderately convex, subquadrate, front straight, base broadly biarcuate,

anterior angles obtuse and declivous, the posterior ones acute, with a longitudinal impressed line at base, and the anterior margin green; scutellum smooth, rounded, and purpureous; elytra flattened, strongly cuneate, margin serrate, and the apex mucronate; each elytron with three fasciae and a longitudinal vitta toward the apex emerald-green, first fascia at base, second and third in front and behind the middle, short, oppositely obliquely placed ("vice versa oblique positis"), and punctate-striate, interstice vaguely and irregularly punctate; body beneath minutely and regularly punctate, green with an emerald-green tinge, and the stigmata golden-yellow; legs green, and the tarsi black. Length, 23 mm.; width, 4 mm. Cuba. From the collections of Gundlach and Poey.

This species and the following (*quadricolor*) are of unusual form for this genus, and rather resemble the female of *Anthaxia cyanicornis* Fabricius.

I have not seen any specimens of this genus from Cuba, and since the distribution of this species is probably confined to that island, the species remains unknown to the writer. Gundlach (1891) records this species from Bayamo, Cuba. This species is not represented in the Poey collection in Philadelphia, but there is a single example labeled No. 792 in the Gundlach Museum in Habana, which is the specimen referred to by Gundlach.

HALECIA QUADRICOLOR Chevrolat

Halecia quadricolor CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 574 (separates p. 150).—GUNDLACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, 1891, p. 157, No. 1417.—KERREMANS, Mon. Bupr., vol. 3, 1909, pp. 413-414.

The following is a translation of Chevrolat's original description:

Elongate, densely punctate, red; beneath green and purple intermixed, legs cyaneo-purpureous, tarsi blackish; head densely punctate and red, around the eyes cyaneous, vertex green; palpi and antennae black; eyes oblong, fuscous; thorax red, subquadrate, and the front narrowed and straight; base bisinuate, its margin green; lateral margins deflexed, strongly arcuately reflexed; above with three deep longitudinal sulci, the dorsal line green, and deeply impressed at base; scutellum green, obscure, transverse and bifoveate; elytra wider than pronotum at base, attenuate posteriorly, obliquely mucronate, obsoletely denticulate, punctate-striate, red, the suture broadly sulcate and green; epipleura bright cyaneous. Length, 24 mm.; width, 5 mm. Cuba. From the collections of Gundlach and Poey.

This species rather approaches in form and color to *Anthaxia suturalis* Olivier.

This is also a Cuban species, and no specimens have been seen which agrees with Chevrolat's description. Gundlach (1891) records it from the western part of Cuba. The species is not represented in the Poey collection in Philadelphia, but there is a single example labeled No. 1417 in the Gundlach Museum in Habana, which is the specimen referred to by Gundlach.

HALECIA ERYTHROPUS (Gory)

Buprestis erythropus GORY, Mon. Bupr. Suppl., vol. 4, 1840, p. 126, pl. 22, fig. 124.

Leptia erythropus DEJEAN, Cat. Coleopt., 2 ed., 1833, p. 78; 3 ed., 1836, p. 89. (No description.)

Halecia erythrope FLEUTIAUX and SALLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, 1890, p. 403 (separates p. 53).—KERREMANS, Mon. Bupr., vol. 3, 1909, p. 420.

Male.—Form narrowly elongate, navicular, and feebly convex; above dark bronzy-green; with strong violaceous, purpureous and cupreous reflections, and the elytra more or less ornated with irregular cupreous markings, which are frequently wanting; beneath similar to above, but more shining, the legs ferrugineous, with a strong iridescent greenish reflection.

Head broadly but not deeply depressed, the depression extending to the margin of the eyes, and from the epistoma to the vertex, and with an obsolete narrow longitudinal groove on the occiput and vertex; surface coarsely and rather sparsely punctate, the punctures shallow and irregularly placed; intervals smooth; epistoma broadly, arcuately emarginate in front, with the outer angles of the emargination forming an obtuse tooth. Pronotum about one and one-half times as wide as long, base and apex about equal in width; sides feebly arcuately attenuate to the basal sixth, where they are strongly sinuate, then obliquely expanded to the posterior angles, which are somewhat projecting and rather acute; anterior margin broadly arcuately emarginate, with the median lobe rather distinct and subangulate; base feebly bisinuate, with a broadly rounded median lobe; lateral margins rounded and only obsoletely marked posteriorly; disk with a broad shallow longitudinal sulcus, which is interrupted at the middle, a transverse depression on each side along anterior margin, and a broad obsolete one on each side about midway between the median sulcus and lateral margin; surface sparsely and rather deeply punctate, the punctures irregular in size and arrangement, and becoming coarser at the sides; intervals smooth. Scutellum short, oblong, two times as wide as long, the surface smooth and shining. Elytra wider than pronotum at base, feebly expanded behind the humeral angles, nearly parallel to apical third, then arcuately attenuate to the tips, which are produced into an acute spine at the outer margin, and then strongly obliquely emarginate to the suture; lateral margins entire; each elytron with a short broad costa at apex, and several irregular obsolete impressions, which are sometimes wanting; surface striato-punctate, the striae feebly impressed, and the punctures fine and more or less confused in the striae, the intervals feebly convex, somewhat rugose toward the sides, and sparsely, irregularly punctate. Abdomen beneath finely and rather

sparsely punctate, the punctures becoming denser on the antero-lateral part of the segments, and sparsely clothed at the sides with rather long, fine recumbent hairs; intervals finely and densely granulose; first segment convex, and not sulcate at middle; last segment truncate at apex. Prosternum coarsely, sparsely punctate, and very sparsely clothed with short inconspicuous hairs, and the intervals smooth; anterior margin truncate; prosternal process feebly flattened on the top, and not longitudinally sulcate, the sides feebly expanded behind the anterior coxal cavities, then arcuately emarginate and attenuate to the apex, which is obtusely rounded.

Female.—Similar to the male, but with the last abdominal segment obtusely rounded at the apex.

Length, 12–15 mm.; width 3.5–5 mm.

This name was first used by Dejean (1823) for a species from North America, which he placed in his genus *Leptia*, but without describing either the genus or species. Gory (1840) described the species under the same name from the specimen in the Dejean collection, and placed it in the old genus *Buprestis*. It has been recorded by Fleutiaux and Sallé (1890) from Guadeloupe, as having been collected by Delauney during September at Camp Jacobs, and also by Vitrac at Trois Rivières and Petit Bourg on a species of *Melastomaceae*.

Specimens which I have determined as this species have been examined from the following localities. Coll. U. S. Nat. Mus.: Three specimens, Dominica, June and July, collected by H. W. Foote of the Yale Expedition of 1913; and one specimen from Guadeloupe (L. Defau). Coll. Amer. Mus. Nat. Hist.: One specimen, Gourbeyre, Guadeloupe. Coll. British Mus.: One specimen, labeled Dominica, G. A. Ramage, 97–67, May 12, 1888.

The elytral depressions are slightly more cupreous in the specimens from Guadeloupe, but there is considerable variation even in these specimens. It is just possible that these specimens represent the species described by Kerremans as *pyropus* from that island, but if so, I can not see any reason for separating the two species.

HALECIA PYROPUS Kerremans

Halecia pyropus KERREMANS, Ann. Soc. Ent. Belg., vol. 37, 1893, pp. 504–505.—KERREMANS, Mon. Bupr., vol. 3, 1909, pp. 419–420.

The following is a translation of Kerremans' original description:

Elongate, at apex attenuate, metallic golden-green, with a cyaneous tinge, the depressions on the head, pronotum and elytra are dark purpureo-violaceous; head granulose, the front excavated; pronotum trapezoidal, uneven, depressed on both sides, and the middle longitudinally sulcate; scutellum transverse; elytra punctate-striate, truncate and dilated at humeri, the apex attenuate and strongly muricate; each elytron with three impressions, first an elongate one on disk, the

second transverse, and placed behind the middle, and the third small and subapical. Body beneath punctate; legs brunneo-purpureous, and the tarsi green. Length, 16 mm.; width, 5 mm. The arrangement and form of the posterior part of the elytra, terminating into a point, gives this species the appearance of a *Dicerca*. Guadeloupe (Lherminier, by Chevrolat).

Genus ACTENODES Lacordaire

Actenodes DEJEAN, Cat. Coleopt., 2 ed., 1833, p. 80; 3 ed., 1836, p. 90.—
LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 72-73.—KERREMANS, Wytzman's
Gen. Insectorum, fasc. 12, pt. 3, 1903, pp. 193-195.

Head vertical and much wider in front than on vertex; front flattened and narrowed by the insertion of the antennae; epistoma short and wide, and more or less emarginate or truncate in front; antennal cavities large, round, and situated at a considerable distance from the eyes. Antennae moderately long, variable, and dentate from the fourth joint, the serrate joints usually armed with poriferous foveae on the lower anterior margin of the joints (some of the species also have obsolete foveae on the upper side). Eyes very large, elliptical, inner margin very oblique and much closer to each other on the vertex than on the front. Pronotum much wider than long, and not closely applied to the elytra at the posterior angles; anterior margin arcuately emarginate; sides sinuate; base with a distinct median lobe. Scutellum small and triangular. Elytra variable, shagreened or finely punctured, with or without costae, rarely with the sides serrate near apex, lobed at base, and strongly attenuate posteriorly. Sternal cavity formed by the mesosternum and metasternum; mesosternum divided, the lateral branches elongate and somewhat triangular; metasternum feebly emarginate or truncate in front. Prosternum feebly convex in front, with the anterior margin more or less declivous; prosternal process flat, strongly constricted by the coxal cavities, behind which it is abruptly and arcuately expanded on each side into a sharp tooth, and with a large acute tooth at the apex, which fits into the sternal cavity. Posterior coxae strongly dilated internally; anterior margin nearly straight; posterior margin oblique. Legs rather robust; anterior and middle femora more or less swollen, the former nearly always dentate on the inner margin; tibiae normal, the anterior pair frequently arcuate in the males; tarsi rather short, the third joint deeply emarginate and divided into two long divergent spines, which extend beyond the fourth joint; tarsal claws simple or feebly expanded at base. Body oblong, rather broad, and more acuminate behind than in front.

The name *Actenodes* was first used by Dejean (1833) in the second edition of his Catalogue des Coléoptères, and in which he included *bellula* Mannerheim from Santo Domingo, *nobilis* Fabricius from Cayenne, and eight species of which no descriptions had been

published. In his third edition of the same work (1836), he gives in addition to the ones mentioned previously, *viridifasciata*, *calcarata*, and *chalybeitarsis*, all from Mexico and credited to Chevrolat, of which *viridifasciata* is only a manuscript name, and which was later described by Castelnau and Gory as *regularis*. Lacordaire (1857) published a description of the genus, and in which he placed a number of species, some of which were previously included in this genus by Dejean.

Actenodes is a rather large genus and has a wide distribution, the species being distributed throughout North, South, and Central America, Mexico, West Indies, and Africa. It is closely allied to *Chrysobothris* and *Colobogaster*, but can be easily distinguished from either of these two genera by the third joint of the tarsi having two long spines, which extend beyond the fourth joint.

KEY TO THE SPECIES

1. Elytra with distinct longitudinal costae..... 2.
Elytra without longitudinal costae..... 3.
2. Pronotum transversely impressed at base; elytral markings cupreous.
..... *marmorata* (Castelnau and Gory).
Pronotum with three longitudinal impressions; elytral markings aeneous.
..... *fulminata* (Schonherr).
3. Elytra with the discal spots distinctly embossed, and of a green color, narrowly margined with aureo-cupreous..... *bellula* Mannerheim.
Elytra with the discal spots not embossed..... 4.
4. Each elytron with a round aureo-cupreous spot at apical third; color above dark aeneous, with olivaceous and purplish reflections.
..... *auronotata* (Castelnau and Gory).
Each elytron with an oblique green fascia at apical third; color above reddish-cupreous..... *auronotata*, var. *jamaicensis* Fisher.

ACTENODES MARMORATA (Castelnau and Gory)

Chrysobothris marmorata CASTELNAU and GORY, Mon. Bupr., vol. 2, 1836, pp. 31-32, pl. 6, fig. 45.

The following is a translation of the original description:

Dark aeneous; thorax with three not very deep foveae; elytra cupreous, and marbled violaceous. Length, 9 lines; width, $3\frac{1}{2}$ lines. Habitat Martinique.

Cupreous, with a feebly darker tinge. Head granulose, with a deep longitudinal groove at the middle, and two elevations between the eyes. Thorax transverse, with an impression at middle behind, and also one on each side, surface covered with small transverse rugae. Elytra granulose, with longitudinal costae, and ornated with an irregular blackish-violet spot at the base, and three irregular oblique sinuate fasciae of the same color, the posterior one situated at the apex. Body beneath and legs punctate and of a beautiful cupreous color. Tarsi violaceous.

This is certainly closely allied to *fulminata* Schonherr, but according to the description given by Castelnau and Gory it is a larger

species, and the elytral markings are cupreous, while in *fulminata* they are aeneous and differently arranged. In figuring *marmorata* the pronotum is shown as being transversely impressed along base, while in the description they say that the pronotum has an impression at the middle behind and another one on each side. Since their descriptions are very deficient, these three impressions may be connected transversely by a shallow groove, similar to some of the specimens of *auronotata*, in which case it would be transversely impressed as shown in the figure. Since Castelnau and Gory had both of the species before them when they described this species, I shall consider them as two distinct species. No specimens have been seen by the writer which would apply to the above description.

ACTENODES FULMINATA (Schönherr)

Buprestis fulminata SCHÖNHERR, Syn. Ins., vol. 1, pt. 8, App. 1817, p. 121, No. 186.

Actenodes signata BEAUDET-LAFARGE, Dejean, Cat. Coleopt., 2 ed., 1833, p. 80; 3 ed., 1836, p. 90. (No description.)

Actenodes cyanura CHEVROLAT, Silbermann's Rev. Ent., vol. 5, 1838, pp. 72-73.

Chrysobothris fulminata CASTELNAU and GORY, Mon. Bupr., vol. 2, 1836, pp. 37-38, pl. 7, fig. 52.

Actenodes fulminata LENG and MUTOHLER, Bull. Amer. Mus. Nat. Hist., vol. 33, 1914, p. 430.

Form broadly elongate, moderately convex, attenuate in front, more acuminate posteriorly; and narrower behind than in front, glabrous and shining; head and pronotum aeneous, with a strong olivaceous and purpureous tinge; scutellum green; elytra nigro-violaceous, with irregular transverse aeneous markings; beneath olivaceous-green, with the tarsi and last abdominal segment cyaneous.

Head feebly convex, front nearly flat, triangular, with a longitudinal groove extending from near the epistoma to vertex, the groove feebly impressed on the front, but becoming very deep on the vertex between the two nodules, which are broad, but not strongly elevated; surface densely, irregularly and deeply punctate, becoming strongly transversely scabrous on the anterior part; intervals nearly smooth, becoming obsolete granulose on the occiput; epistoma feebly, broadly emarginate in front, with an obsolete median tooth; eyes large, very oblique and about two times as widely separated on the occiput as in *auronotata*. Pronotum strongly transverse, and moderately convex, two times as wide as long, apex and base about equal in width, widest at apical third; sides broadly rounded at apical third, then arcuately attenuate to the posterior angles, which are nearly rectangular; anterior margin arcuately emarginate, with an obsolete median lobe; base bisinuate, with a broad, feebly rounded median lobe; surface with a very broad longi-

tudinal median depression, deeper behind than in front, and on each side of which is a large, moderately deep, round depression, sparsely, deeply and rather regularly punctate on the disk, becoming coarsely, irregularly rugose toward the sides, the rugae long, strongly elevated, and widely separated; intervals finely and densely granulose. Scutellum very small, triangular, the sides about equal in length. Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, nearly parallel to behind middle, then obliquely attenuate to the tips, which are rather acute; lateral margins very coarsely serrate to near middle; each elytron strongly angularly lobed at base, with a feeble transverse basal impression, and four more or less distinct sinuate longitudinal costae, none of which extend to the apex; surface densely, deeply and irregularly punctate, the punctures becoming confluent toward the sides; intervals densely and rather coarsely granulose; each elytron ornated with aeneous markings, which are very narrowly margined with cyaneous and arranged as follows: An elongate circle enclosing a dark area at base and extending backward forming the letter C, with the opening toward the suture; at basal third a broad transverse fascia, forming posteriorly the letter W between the first and second costae, and then extending transversely to the suture, and forward along the suture to the base; at the middle there is a very irregular zigzag fascia extending from the lateral margin and forming the letter M between the first and second costa, then obliquely backward to the suture at apical third, and following the suture to apex, where it is sometimes connected to a narrow band along the lateral margin, which extends forward to the apical third; there is also an oblong spot behind the humeral angle. Abdomen beneath moderately convex, sparsely but not very deeply punctate; intervals smooth and shining; last segment more densely punctured posteriorly, with the apex broadly sinuate and armed on each side with a tooth. Prosternum feebly convex, broadly truncate and declivous in front; surface sparsely and rather coarsely punctate, becoming irregularly striolate toward the sides; prosternal process feebly convex, strongly expanded behind the coxal cavities, the sides very long and acute, and extending between the anterior and middle coxae, the median tooth long and acute at apex. Posterior tibiae with a dense line of very long fine hairs on the inner margin.

Length, 15 mm.; width, 6 mm.

This species was described by Schonherr from Brazil, and the above description was made from a specimen donated to the United States National Museum by the British Museum, which was collected at Jatahy, Brazil, and determined by Kerremans as *fulminata* Schonherr. *Actenodes cyanura* was described by Chevrolat from Cayenne, and has been placed as a synonym of *fulminata* by Kerre-

mans. I have examined another specimen received from the British Museum from Cayenne, and labeled "*signata* Beaud.-Lafarge, *cyanura* Chevr." which agrees very well with Chevrolat's description of *cyanura*, and which only differs from the specimen of *fulminata* from Brazil in a few minor details; being smaller (12.5 mm. long; and 5 mm. wide), head not quite as densely rugose, median depression on pronotum more obsolete anteriorly, and the elytra more sparsely and finely punctate, otherwise they are the same, which verifies Kerremans conclusions as to the synonymy.

So far, this species has only been recorded in the literature as occurring in the West Indies, by Leng and Mutchler in their Preliminary List of the Coleoptera of the West Indies.¹⁷ This record was probably copied from Linell's card catalogue of the West Indian Coleoptera, in which he had recorded the original description of *cyanura* Chevrolat, and erroneously cites the locality as Martinique instead of Cayenne. The species probably does not occur in the West Indies, its distribution being restricted to South America, but the above description is included, so that in case its distribution should extend into the Antilles, it can be easily identified.

ACTENODES BELLULA Mannerheim

Actenodes bellula, var. *sobrina* MANNERHEIM, Dejean, Cat. Coleopt., 2 ed., 1833, p. 80; 3 ed., 1836, p. 90. (No description.)

Actenodes bellula MANNERHEIM, Bull. Soc. Imp. Nat. Moscou, vol. 10, no. 8, 1837, pp. 79-80.—CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 534 (separates p. 160).

Form elongate, and moderately convex, attenuate in front, more acuminate posteriorly, and narrower behind than in front, subopaque and glabrous; dark aeneous, with a feeble olivaceous or purpureous tinge; scutellum aeneo-viridis; each elytron ornated with four green spots (the two discal ones strongly embossed), which are narrowly marginal with aureo-cupreous, and sometimes the margin behind scutellum narrowly cupreous; beneath aeneous, with an olivaceous tinge, and more shining and purpureous than above; tarsi cyaneous.

Length, 10-14 mm.; width, 4-5.5 mm.

This species is very closely allied to *auronotata* Castelnau and Gory, but differs from it as follows: Form more slender, elytra more acuminate posteriorly, surface more finely punctured, and the spots smaller, round, and the four discal ones distinctly embossed, and of a clearer green color, narrowly margined aureo-cupreous; sides of prosternum more coarsely punctate, and the punctures more confluent.

¹⁷ Bull. Amer. Mus. Nat. Hist., vol. 33, 1914, p. 430.

Dejean (1833) lists *bellula* from Cuba and *bellula*, var. *sobrina* Mannerheim, from Santo Domingo, without giving any descriptions. *Actenodes bellula*, var. *sobrina* as used by Dejean is a manuscript name, but Mannerheim (1837) under the name of *bellula* gives a description of the *A. bellula*, var. *sobrina* Mannerheim listed by Dejean in his Catalogue from the island of Santo Domingo, and in which he writes, "Not possessing the real *Actenodes bellula* Dejean, I have been obliged to describe the variety." Since no description had been published of *bellula*, this name must be applied to the species described by Mannerheim from Santo Domingo, and *sobrina* Mannerheim will have to be placed as a synonym of that species. The specimen in the Dejean Collection under *bellula* Dejean from Cuba, will be the true *auronotata* Castelnau and Gory.

Chevrolat (1867) records this species from Santo Domingo in the collection of (Dejean) Mnizech, and considers it distinct from *auronotata*.

The species seems to be confined to Santo Domingo, and I have examined specimens from the following localities: Coll. British Mus.: Haiti, from the Chevrolat Collection. Coll. Mus. Comp. Zool.: Petionville and Manneville, Haiti (W. M. Mann). Coll. U. S. Nat. Mus.: Port-au-Prince, Haiti (R. J. Crew) received from H. W. Wickham.

ACTENODES AUROTATA (Castelnau and Gory)

Actenodes bellula DEJEAN, Cat. Coleopt., 2 ed., 1833, p. 80; 3 ed., 1836, p. 90. (No description.)

Chrysobothris auronotata CASTELNAU and GORY, Mon. Bupr., vol. 2, 1836, p. 20, pl. 4, fig. 30; addenda, p. 6.—JACQUELIN DUVAL, in Ramon de la Sagra's Hist. Phys. Polit. et Nat. de l'île de Cuba, Anim. Artic., 1857, (French edition) p. 64, pl. 7, fig. 8; (Spanish edition), vol. 7, 1857, p. 29; vol. 8, pl. 7, fig. 8.

Actenodes auronotata CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 584, (separates p. 160).—GUNDLACH, Contribucion à la Entom. Cuba, vol. 3, pt. 5, 1891, p. 168, No. 201.

Actenodes bella LECOMTE, Trans. Amer. Philos. Soc., vol. 11, 1859, pp. 240-241.

Buprestis auriguttata STURM, Catal. Insecten Sammlung, 1826, p. 104.

Chrysobothris auriguttata STURM, Catal. Käfer Sammlung, 1843, p. 61.

Form broadly elongate and moderately convex, attenuate in front, more acuminate posteriorly, and narrower behind than in front, subopaque and glabrous, dark aeneous, with a feeble olivaceous or purpureous tinge; scutellum aureo-viridis; elytra ornated with aureo-viridis markings, sometimes the markings strongly cupreous, but not embossed; beneath aeneous, with an olivaceous tinge, and more shining and purpureous than above; tarsi cyaneous.

Head feebly convex, front nearly flat, triangular, with a feeble longitudinal groove extending from near the epistoma to the vertex,

where it terminates abruptly into an acute elevation, there is also on each side of the groove at the posterior part of the front an obsolete nodule; surface densely, irregularly and deeply punctate, the punctures very irregular in size, and becoming somewhat confluent on the epistoma; intervals densely and obsoletely granulose; epistoma broadly and feebly emarginate, broadly rounded on each side of the emargination, and with a short obtuse tooth at the middle; eyes very large, rather acutely rounded at bottom, and nearly contiguous on occiput. Pronotum strongly transverse and moderately convex, two times as wide as long, slightly narrower in front than behind, widest at base, with a distinct arcuate lateral carina, which curves inward toward the transverse impression; sides feebly arcuately rounded to the posterior angles, which are somewhat projecting and widely separated from the elytra (sometimes the sides are rather strongly rounded at apical third, then feebly concave to the posterior angles); anterior margin arcuately emarginate, with a feeble median lobe; base bisinuate, with the median lobe broadly and feebly rounded; surface abruptly declivous at the sides, with a transverse depression at the basal third, which is more deeply impressed on each side, and densely, irregularly and coarsely punctate, the punctures more elongate on the disk, and becoming somewhat confluent and rugose toward the sides; intervals finely, densely granulose. Scutellum triangular, all sides about equal in length. Elytra distinctly wider than pronotum at base, and with a feeble, broad basal depression; sides broadly rounded at humeral angles, nearly parallel to apical third, then arcuately attenuate to the tips, which are conjointly broadly rounded; lateral margins strongly serrate to middle; base acutely lobed; surfaced without costae, densely, coarsely and deeply punctate, the punctures somewhat irregularly placed, becoming nearly confluent at sides and on basal region; intervals finely and densely granulose; each elytron ornated with aureo-viridis spots as follows: An oblong spot at base near humeral angle; two round spots placed transversely at middle, one near the lateral margin, the other on disk at middle; a round spot on disk at apical third, slightly closer to the suture than the median spot; the suture behind scutellum and near apex, and the lateral margin at humeral angle and near apex is also sometimes aureo-viridis with a cupreous tinge. Abdomen beneath moderately convex, sparsely and irregularly punctate, the punctures shallow and becoming somewhat striolate on the sides of basal segment; intervals densely, obsoletely granulose, and with an obsolete longitudinal impression behind each puncture; last segment broadly truncate or obsoletely rounded at apex, with the angles prominent, armed on each side with a tooth in the female, and broadly and feebly angularly emarginate in the male. Prosternum short, broadly truncate and strongly declivous

in front, the surface densely, coarsely punctate, and transversely rugose on the anterior part; prosternal process flat, very strongly expanded behind the coxal cavities, the sides long, very acute, and separating the anterior and middle coxal cavities, the median tooth at apex long and acute.

Length, 10-15 mm.; width, 4.5-6.5 mm.

This species was described by Castelnau and Gory (1836) from Cuba, and in figuring the species used the name *auronoto*, but this was changed to *auronotata* in their addenda (p. 6). LeConte (1859) described the same species from a single specimen from Liberty County, Georgia, United States, under the name of *bella*. Kerremans¹⁸ has erroneously placed this species as a synonym of *bellula* Mannerheim.

Recorded from Cuba by Jacquelin Duval as the "Golden-marked Chrysobothris." Gundlach (1891) records it as found throughout the island of Cuba. Chevrolat (1867) says that it found over the entire island and in the collections of Gundlach, Poey, and Chevrolat. I have examined specimens from the following localities. Coll. Amer. Mus. Nat. Hist.: Rio Seco, San Carlos Estate, Guantanamo, Cuba, June 20, 1912; male and female, Guantanamo, Cuba (Chas. T. Ramsden). Coll. Carnegie Mus.: Nueva Gerona, Isle of Pines, July 23, 1912. Coll. British Mus.: Cuba. Coll. U. S. Nat. Mus.: Trinidad, Cuba, April-May, 1912 (Joe Merrill); Savannah, Georgia; Lake Worth, Florida, June 4; and Biscayne, Florida May 27 (Hubbard and Schwarz); Marathon, Florida, Mar. 8, 1919 (Schwarz). Coll. S. C. Bruner: One specimen, Santiago de las Vegas, Cuba, May 20, 1923 (J. Acuna). Coll. Acad. Nat. Sci. Philad.: One specimen, Cuba (Poey Coll. No. 340). This species is also represented in the Gundlach Museum in Habana by a single example labeled No. 201, which was not available for study.

ACTENODES AURONOTATA, var. JAMAICENSIS, new variety

Form broadly elongate and moderately convex, attenuate in front, more acuminate posteriorly, and narrower behind than in front, moderately shining and glabrous; head reddish-cupreous, with the reliefs olivaceous-green; pronotum reddish-cupreous, and somewhat olivaceous-green on disk; scutellum green; elytra reddish-cupreous, with the base, suture, posterior half of lateral margin, narrowly margined with green, and each elytron ornated with bright green spots as follows: A large transverse spot at base; two large nearly confluent spots placed transversely just in front of middle, the outer one smaller, more oblong, and placed near the lateral margin, the other one large, round, and placed on the disk; and an oblong fascia

¹⁸ Wytsman's Gen. Insectorum, fasc. 12, pt. 3, 1903, p. 194.

at apical third, which does not extend to the lateral margin nor suture; beneath more shining than above, olivaceous-green with a strong reddish-cupreous reflection, the legs more reddish-cupreous, and the tarsi cyaneous.

Length, 13 mm.; width, 5.5 mm.

Type locality.—Jamaica.

Type.—W. J. Holland Collection.

Paratype.—Cat. No. 26807, U.S.N.M.

Described from two specimens kindly loaned by Dr. W. J. Holland, and which were collected by F. Klages. There is also a specimen loaned by the British Museum and labeled Jamaica 78-22, which I have placed with this variety. It differs from the type only in coloration, being more brownish-green, and not so reddish-cupreous as in the type.

This species is very closely allied to *auronotata* Castelnau and Gory, but at least should be separated from that species as a good variety. It differs from it in the coloration, which is of a reddish-cupreous color, more shining, and not quite as convex, the elytra not quite as densely punctate and the punctures more widely separated, the base, suture, and posterior half of elytra margined with green, elytral spots bright green, the two in front of middle larger and nearly confluent, and with a short oblique fascia at apical third.

Genus CHRYSOBOTHRIS Eschscholtz

Chrysobothris ESCHSCHOLTZ, Zool. Atlas, vol. 1, 1829, p. 9; reprint, p. 8.

Chrysobothris SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 310-311, pl. 12, fig. 29.—LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 75-76.—CASTELNAU and GORY, Mon. Bupr., vol. 2, 1836-1837, pp. 1-59, pls. 1-10.—KERREMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 3, 1903, pp. 183-192.—HORN, Trans. Amer. Ent. Soc., vol. 13, 1886, pp. 65-124, pls. 2-7.

Odontomus KIRBY, Richardson's Fauna Bor. Amer., vol. 4, 1837, p. 156.

Head vertical, much wider in front than on vertex; front even or uneven, narrowed by the insertion of the antennae, and frequently separated from the vertex by a sharp transverse carina; epistoma broad, more or less sinuate or emarginate in front, and constricted posteriorly by the antennal cavities, which are small, rounded, and situated at a considerable distance from the eyes. Antennae moderately long; first joint elongate, clavate and feebly arcuate; second very short and globular; third elongate and more or less clavate; the first three joints as long as the following joints united; following joints triangular, usually transverse, and armed with a poriferous fovea situated on the interior margin of the joints. Eyes very large, elongate, inner margins very oblique, and much nearer to each other on vertex than at the front. Pronotum much wider than long, and variable in shape; base strongly bisinuate, frequently lobed at the

middle, the lobe sometimes strongly produced and truncate. Scutellum very small and triangular. Elytra variable, lobed at base, strongly attenuate posteriorly, with the sides near apex frequently serrate. Sternal cavity formed by the mesosternum and metasternum; mesosternum divided, the lateral branches variable in shape; metasternum truncate in front, with a very feeble emargination at the middle. Prosternum flat or convex; anterior margin variable; prosternal process constricted by the coxal cavities, behind which it is strongly expanded, with a large acute tooth at the middle, which fits into the sternal cavity. Posterior coxae strongly dilated internally; anterior margin subsinuate; posterior margin oblique. Legs rather robust; femora swollen at middle, and the anterior pair more robust, sharp on the inner margin and armed with a large obtuse tooth (very rarely the tooth is absent); anterior and middle tibiae more or less arcuate; posterior pair straight; tarsi compressed, first joint of posterior pair rather long, third joint feebly emarginate, and not armed with two long spines, the fourth very short; tarsal claws simple. Body oblong, rather broad, rarely elongate, and more attenuate behind than in front.

The species of this genus are very numerous, and are found in nearly all parts of the world. Some of the species are of great economic importance, one of which occurs throughout the West Indies has become very injurious to the Australian Pine (*Casuarina equisetifolia* Forster) in the southern part of Florida, where this plant has been introduced for ornamental purposes. Of the other species found in this region, practically nothing is known of their life histories.

This genus is closely allied to *Actenodes*, but can be easily separated from that genus by the absence of the two long spines on the third joint of the posterior tarsi.

KEY TO THE SPECIES

1. Base of pronotum produced into a large rectangular lobe at middle and nearly covering the scutellum; prosternal process nearly smooth and very wide between the anterior coxal cavities, nearly two times as wide as the cavity..... *sexpunctata* (Fabricius).
- Base of pronotum not produced at middle, at most with only a broadly rounded median lobe; scutellum not covered; prosternal process coarsely punctate and not much wider than the anterior coxal cavities..... 2.
2. Pronotum uneven, with distinct depressions and elevations..... 3.
- Pronotum regularly convex, without depressions or elevations..... 6.
3. Eyes nearly confluent on occiput, separated by less than one-fourth the distance between the antennal cavities..... 4.
- Eyes more widely separated on the occiput, separated by at least one-half the distance between the antennal cavities..... 5.
4. Anterior femora with a large obtuse tooth on outer margin; posterior foveae on elytra obcordate and situated between the second and fourth

costae; last abdominal segment of female with two shallow semi-circular emarginations at apex.-----tranquebarica (Gmelin). Anterior femora without a tooth on outer margin; posterior foveae on elytra irregular and situated between the first and fourth costae; last abdominal segment of female broadly arcuately emarginate at apex.

tumida Chevrolat.

5. Elytra acuminate posteriorly and produced into a spine at apex.

antillarum Fisher.

Elytra broadly rounded at apex----- dentipes (Germar).

6. Elytra acuminate at apex and prolonged into a spine at middle of each elytron----- bella Fisher.

Elytra rounded at apex, without a distinct median spine on each elytron. 7

7. Sides of pronotum strongly angulated near the apical angles_____ 8

Sides of pronotum not angulated----- 12.

8. Pronotum with transverse green, violaceous, and reddish-cupreous fasciae
quadrimaculata (Fabricius).

Pronotum unicolored ----- 9.

9. Elytra with two green fasciae----- lepida Castelnau and Gory.

Elytra without green fasciae, but with round green or concolorous depressions----- 10

10. Elytral spots feebly cupreous or concolorous, the posterior two placed transversely.----- *megacephala* Castelnau and Gory.

Elytral spots green, the posterior two placed obliquely 11.

11. Epistoma with a narrow acutely rounded emargination at middle; elytral spots large, and with a green humeral spot on each elytron.

chlorosticta Thomson.

Epistoma broadly angularly emarginate in front; elytral spots small, and without the green humeral spots----- parvofoveata Fisher.

12. Sides of pronotum widest near apical angles----- 13.

Sides of pronotum regularly arcuate, widest near the middle----- 16.

13. Pronotum dark aeneous; elytra violaceous-black, with transverse green and reddish-cupreous fasciae----- thomae Kerremans.

Pronotum reddish-cupreous or violaceous----- 14.

14. Pronotum violaceous-green; elytra purpureous, with transverse green fasciae----- wolcottii Fisher.

Pronotum reddish-cupreous; elytra brownish-aeneous, with greenish or
violaceous markings----- 15.

15. Each elytron with the base and two round discal spots green, and the basal and median foveae deeply impressed; pronotum with rather sparsely placed elongate punctures----- *hispaniolae* Fisher.

Each elytron with the base, suture at basal fourth, and two transverse fasciae green or olivaceous, the median foveae only feebly impressed; pronotum with rather densely placed round punctures.

thoracica (Fabricius).

16. Anterior femora with the tooth serrate on the exterior margin.

insulana Fisher.

Anterior femora with the tooth not serrate on the exterior margin.— 17.

17. Elytral markings golden-green; antero-median spot transversely oblique and usually connected along the lateral margin with the transverse basal fascia; pronotum arcuately rounded at sides _____ *sexfasciata* Schaeffer.

Elytral markings bluish-green, large, oblong, and not connected along the lateral margin to the basal fascia; pronotum feebly arcuately rounded and nearly parallel at the sides---- *sexfasciata*, var. *jamaicensis* Fisher.

CHRYSOBOTHRIS SEXPUNCTATA (Fabricius)

Buprestis impressa OLIVIER, Entomol., vol. 2, gen. 32, 1790, pp. 44-45, pl. 5, fig. 42 (Name preoccupied); Enc. Method, vol. 5, *Buprestis*, 1790, p. 226, no. 67.—HERBST, Nat. Syst. Ins. Kafer, vol. 9, 1801, p. 233, pl. 150, fig. 4.

Buprestis secpunctata FABRICIUS, Syst. Eleuth., vol. 2, 1801, p. 206, no. 111.—SCHÖNHERR, Syn. Ins., vol. 1, pt. 3, 1817, p. 255, no. 216.

Buprestis splendens VOET, Catal. Coleopt., vol. 1, 1801, p. 96, pl. 51, fig. 20.
Colobogaster secpunctata CASTELNAU and GORY, Mon. Bupr., vol. 2, 1836, p. 9, pl. 2, fig. 7.

Chrysobothris secpunctata WATERHOUSE, Biol. Centr.-Amer., Coleopt., vol. 3, pt. 1, 1887, p. 35.

Male.—Form broadly oblong, and moderately convex, subopaque; color green, with a strong cupreous or aureous tinge, each elytron ornated with three round green impressed spots, and arranged as follows: One at the basal lobe, the second on middle of disk just in front of the middle, and a smaller one at apical third, placed closer to the lateral margin than the suture; beneath green, tip of abdomen and tarsi cyaneous.

Head nearly flat, with the front long, triangular, and the sides obliquely narrowed to the apex; occiput rather narrow and feebly longitudinally carinate, front with a broad transverse crescent-shaped depression, which is more deeply longitudinally impressed at the middle, causing an arcuate elevation behind and two semi-circular elevations in front, there is also a narrow deep groove extending arcuately around the antennal cavities, and connected to a much deeper transverse groove behind the epistoma; vertex with an obsolete chevron-shaped groove; surface coarsely and rather densely punctate, the punctures somewhat confluent on the front, and irregularly placed; intervals finely and densely granulose; eyes very large, strongly convex, about evenly rounded at bottom and top, and separated on the occiput by one-half the distance between the antennal cavities, which are surrounded by a narrow circular depression, bordered posteriorly by a sharp arcuate carina; epistoma broadly angularly emarginate at middle, with the lobe on each side strongly angulated at middle; antennae rather long, third joint cylindrical, clavate, and about as long as the following four joints united. Pronotum strongly transverse, one and one-half times as wide as long at median lobe, widest just in front of middle, apex and base about equal in width; sides obliquely expanded to near middle, where they are emarginate and abruptly declivous, then arcuately rounded to the posterior angles, which are acute, the lateral margin sharply defined, extending from base to apical third and not visible from above; anterior margin nearly straight, with an obsolete median lobe; base very deeply arcuately emarginate on each side at the elytral lobe, with the median lobe strongly produced

backward, and feebly broadly rounded at the apex; surface feebly convex, with a rather deep, round depression on each side of disk in front of elytral lobe, sparsely and rather deeply punctate, the punctures irregular in size and well separated; intervals finely and densely granulose. Scutellum very small and nearly concealed by the median lobe of pronotum. Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, nearly parallel to apical third, then arcuately attenuate to the tips, which are produced into an acute tooth near the suture; lateral margins finely, obsoletely serrate to near the middle, the teeth very short and irregularly placed; humeri rather prominent; base produced into a broadly rounded lobe; surface finely and rather densely punctate, the intervals obsoletely granulose; each elytron with an obsolete longitudinal costa along suture behind the middle, a similar one along the lateral margin, and with three round green depressed spots as noted above. Abdomen beneath densely and finely punctate, with spots of dense pubescence on the sides of the segments, and the intervals obsoletely granulose and more shining than above; first segment feebly impressed at middle; last segment deeply longitudinally concave, and the lateral margins with a distinct emargination near the apex, without a serrate submarginal ridge, the apex deeply and arcuately emarginate, with a strongly elevated longitudinal carina on each side of the emargination. Prosternum with a broadly rounded median lobe in front, surface somewhat gibbose, sparsely and very finely punctate, and the intervals obsoletely granulose; prosternal process feebly convex, very wide between the coxal cavities, only feebly dilated behind them, and the apex with a short triangular tooth. Femora robust; anterior pair with a broad round obtuse tooth on the outer edge, placed closer to the apex than base, and strongly dentate on the exterior margin. Anterior and middle tibiae strongly arcuate, the former flattened on the inner surface, but without any dilatation; the posterior pair straight and sub-cylindrical.

Female.—Differs from the male in having the first abdominal segment more deeply depressed at middle, and the apex of the last ventral segment not as deeply emarginate, and the emargination more broadly, and not acutely arcuate.

Length, 15 mm.; width, 6.5 mm.

Described from South America by Fabricius without giving any definite locality. The species is rather common throughout the northern part of South America and has been recorded from Nicaragua, but has not been previously reported from the West Indies. In the United States National Museum collection are two specimens labeled Barbados, W. I., February 2, 1908 (F. J. Clarke-Ballou No. 969).

CHRYSOBOTHRIS TRANQUEBARICA (Gmelin)

- Buprestis impressa* FABRICIUS, Mant. Ins., vol. 1, 1787, p. 182, no. 61. (Preoccupied.)
- Buprestis tranquebarica* GMELIN, Linnaeus, Syst. Nat., 13 ed., vol. 1, pt. 4, 1788, p. 1932, no. 74.
- Buprestis excavata* OLIVIER, Enc. Method., vol. 5, 1790, *Buprestis*, p. 232, no. 95.—FABRICIUS, Ent. Syst., vol. 1, pt. 1, 1792, p. 206, no. 84; Syst. Eleuth., vol. 2, 1801, p. 205, no. 105.
- Chrysobothris fraterna* MANNERHEIM, Bull. Soc. Imp. Nat. Moscou, vol. 10, no. 8, 1837, pp. 75-76.
- Chrysobothris rugosa* MANNERHEIM, Bull. Soc. Imp. Nat. Moscou, vol. 10, no. 8, 1837, pp. 74-75.
- Chrysobothris denticulata* CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, p. 46, pl. 8, fig. 62.
- Chrysobothris denticollis* GORY, Mon. Bupr. Suppl., vol. 4, 1840, p. 178, pl. 30, fig. 173.
- Chrysobothris impressa* CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 586 (separates p. 162).—GUNDLACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, 1891, pp. 169-170; An. Soc. Espan. Hist. Nat., ser. 2, vol. 22, 1894, p. 623.—STAHL, Fauna de Puerto Rico, 1882, p. 171.
- Chrysobothris tranquebarica* FLEUTIAUX and SALLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, 1890, p. 404 (separates p. 54).—FISHER, Proc. Ent. Soc. Wash., vol. 20, 1918, pp. 173-177.—SNYDER, Journ. Agri. Research, vol. 16, 1919, pp. 155-163, pls. 18-21, text figs. 1-2.

Male.—Form short, rather broad, and strongly depressed, subopaque; head cupreous or aeneous, with the epistoma auro-viridis; pronotum and elytra dark aeneous; each elytron with four foveae, a deep one at basal lobe, a more shallow one near humerus, a large bilobed one on disk near middle, interrupting the second costa, and an obcordate one at apical third, situated between the second and fourth costae, usually the foveae are concolorous, but sometimes the discal ones are of a lighter shade, and rarely of a reddish-cupreous color; beneath dark aeneous and more shining than above.

Head flat, with the front triangular and the sides very strongly obliquely narrowed to the vertex; occiput very narrow, and with a distinct longitudinal carina, which is sometimes feebly forked anteriorly and forming a chevron; front flat, deeply transversely impressed behind the epistoma, with a short sinuate carina behind each antennal cavity, and a more elevated one at middle of front, the carinae not extending entirely to the margins, there is also a narrow groove extending arcuately around the antennal cavities and margined posteriorly by a short elevated carina; surface densely and coarsely punctate, the punctures confluent, and the reliefs forming a network of irregular polygonal areas, rather densely clothed with very fine, long inconspicuous hairs; eyes very large, strongly convex, more acutely rounded on top than at bottom, and nearly confluent on the occiput; epistoma narrow, elevated, broadly triangularly emarginate at middle, with the lobes broadly rounded; antennae

rather long, very pubescent, third joint as long as the following three joints united, the outer joints compact. Pronotum strongly transverse, more than two times as wide as long, widest along middle, slightly narrower in front than behind; sides obliquely expanded from apex to apical third, then nearly parallel and feebly sinuate to basal third, and finally arcuately attenuate to the posterior angles, which are nearly rectangular; anterior margin arcuately emarginate, without a distinct median lobe; base arcuately emarginate on each side at the elytral lobe, with a broadly rounded median lobe, which is subtruncate in front of scutellum; disk moderately convex, with an obsolete median depression, on each side of which, is an oblique post-apical one, and three other feebly impressed ones between the middle and side; surface coarsely and deeply punctate, the punctures well separated on the disk, but becoming denser and somewhat confluent at the sides; intervals nearly smooth. Scutellum moderately large, longer than wide, and the surface obsoletely granulose. Elytra wider than pronotum at base, but about equal in width to it at middle; sides broadly rounded at humeral angles, nearly parallel to apical third, then arcuately attenuate to the tips, which are obtusely rounded; lateral margins strongly serrate to the humeral angles; humeri moderately prominent; base with a rather acutely angulated lobe; disk feebly convex, and each elytron with four costae, the first extending to apex along suture, elevated to basal third, then continuing as a smooth line to basal fovea, the second feebly elevated, beginning at the basal depression, interrupted by the median fovea, and continuing to the posterior fovea, the third feebly elevated, and extending between the median and posterior foveae, and the fourth rather strongly elevated, extending along the lateral margin behind the posterior fovea, but not attaining the apex; surface coarsely and densely punctate, the punctures regular in size, but becoming denser and more confluent toward the sides; intervals smooth. Abdomen beneath sparsely and very coarsely punctate, the punctures elongate, with the posterior margins not well defined, sparsely clothed with long cinereous hairs, the intervals obsoletely granulose, sides of segments with flat smooth spaces and the posterior angles prolonged into an acute tooth; first segment broadly concave; last segment with the lateral margins entire, with a strongly elevated serrate submarginal ridge, and deeply arcuately emarginate at the apex. Prosternum broadly rounded in front, and without a median lobe; surface transversely depressed along anterior margin, sparsely, finely punctate, transversely rugose, and sparsely clothed with long cinereous hairs; prosternal process flat, strongly expanded behind coxal cavities, and the apex with a long triangular tooth. Femora robust, anterior pair with a large obtuse tooth on the outer

edge, situated closer to the apex than base, and feebly dentate on the exterior margin. Anterior tibiae suddenly reflexed at middle and not dilated at apex; middle pair strongly arcuate; posterior pair straight.

Female.—Differs from the male in having the front of head less pubescent and the chevron on vertex more distinct, anterior and middle tibiae nearly straight, the last ventral segment of abdomen with a broad median carina at base, a depression on each side, and the apex with two shallow semi-circular emarginations, the median tooth short and the lateral ones long and acute.

Length, 12–16 mm.; width, 5–7 mm.

There has been considerable confusion in regard to the identification of this species. This insect is a common and destructive enemy of the red mangrove (*Rhizophora mangle* Linnaeus) but did not become of any great economic importance until about the year 1916, when it attacked the Australian Pine (*Casuarina equisetifolia* Forster) planted in southern Florida for shade and ornamental purposes. As this insect is rather widely distributed throughout the West Indies, and the Australian pine is also being planted in these islands, it may become an economic problem in that region. The specimens do not seem to vary except in the coloration of the elytral foveae, in some specimens the foveae are unicolorous with the elytra, while in others they are distinctly purplish. It has a rather wide distribution, having been taken in nearly all of the Antilles and the southern part of Florida. So far, there are no authentic records of it having been collected in Cuba, and this is rather strange, since its natural food plant is found on this island. The only other species with which it could be confused is *tumida* Chevrolat, described from Cuba, but is easily separated from that species by the anterior femora having a large obtuse tooth on the outer margin.

Fabricius (1787) described the species from "Tranquebarica" under the name *impressa*, which he had previously used (1775) for another species from "Indiis." Gmelin (1788) proposed the new name *tranquebarica* for this species. Olivier (1790) proposed a new name *excavata* for the same species, and this name was used by Fabricius in all his later works. Fabricius and Olivier, either did not know of Gmelin's work, or would not recognize his names, as the name *tranquebarica* was not used by either of these writers in their works. Mannerheim (1837) described the species as *fraterna* from Porto Rico, and *rugosa* from an unknown locality. Castelnau and Gory (1837) described *denticulata* from Guadeloupe, and gives an excellent figure of the species, which is the species found in Florida, but in their addenda places it as a synonym of *fraterna* Mannerheim. Gory (1840) described *denticollis* from Colombia, which is not different from *denticulata*. Chevrolat (1867) records

it from Santo Domingo and Guadeloupe, in the collection of the author, and writes that it is common in these two islands and probably will be found in Cuba. Gundlach (1891) records it from the same localities. Fleutiaux and Sallé (1890) record it from Guadeloupe: Camp Jacobs (Delauney); Basse-Terre, "dans les poteaux de la cour du séminaire" (P. Coste) (Vitrac). Snyder (1919) records the habits of this species in Florida and gives methods for combating it. It is also recorded by Gundlach (1894), and Stahl (1882) from Porto Rico.

Specimens have been examined from the following localities: Coll. British Mus.: St. Domingue and Guadeloupe (Coll. Chevrolat); St. Thomas; Caliveny Est., windward side, Grenada (H. H. Smith). Coll. U. S. Nat. Mus.: Higueral, Santo Domingo, April 11, 1913 (J. R. Johnson); Mayaguez, Porto Rico, May 20, 1914 (R. H. Van Zwahlenburg); Higueral, Santo Domingo, February, 1916 (E. G. Smyth). Coll. H. W. Wickham: Port-au-Prince, Haiti (R. J. Crew). Coll. Mus. Comp. Zool.: Grande Riviere, St. Marc and Cape Haitien, Haiti (W. H. Mann). Coll. Porto Rico Exp. Sta.: San Sebastian, Porto Rico, April 20, 1921 (G. N. Wolcott). Coll. Amer. Mus. Nat. Hist.: Mangrove Cay, Andros Island, Bahamas, May-June (W. H. Mann); Mayaguez, Porto Rico, May 30, 1914 (R. H. Van Zwahlenburg); Sanchez, May 24, 1915, and San Lorenzo, June 29, 1915, Dominican Republic (F. E. Watson); Mannville, Gaure road, Haiti, Feb. 6, 1922 (F. E. Watson).

CHRYSOBOTHRIIS TUMIDA Chevrolat

Chrysobothris tumida CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1887, p. 535 (separates p. 161).—GUNDLACH, Contribucion à la Entom. Cuba, vol. 3, pt. 5, 1891, pp. 163-169, no. 839.

Female.—Form short and broad, strongly depressed, subopaque; color above dark aeneous, with a strong purpureous reflection; each elytron with ten feeble purpureous or concolorous foveae, four of which are distinct and the remainder more or less obsolete, and arranged as follows: A deep round one at basal lobe, a narrow transverse obsolete one along base near humeral angle, a broad and deeper one behind the second, a broad obsolete one along suture behind the first, three small obsolete ones along lateral margin behind the humerus, a large distinct bilobed one on disk near middle, interrupting the second costa, a distinct zigzag one at apical third, situated between the first and fourth costae, and partially interrupted by the third coata, and an elongate obscure one near the apex; beneath aeneous, more shining than above, and with strong purpureous reflections.

Head flat, with the front triangular, and the sides very strongly obliquely narrowed to the vertex; occiput very narrow and longi-

tudinally carinate; front flat, deeply transversely impressed behind the epistoma, and with two transverse irregular elevations, which are more or less obsolete and extending nearly to the eyes, there is also a narrow groove extending around the antennal cavities and margined posteriorly by a short elevated carina; vertex with a distinct transverse arcuate smooth elevation extending to the eyes; surface densely and coarsely punctate, the punctures confluent, irregular in shape and size, and rather sparsely clothed with long, fine, erect hairs, which do not conceal the surface; eyes large, more acutely rounded on top than at bottom, and nearly confluent on the occiput; epistoma narrow, elevated, broad triangularly emarginate at the middle, with the lobes broadly rounded; antennae rather long, and very pubescent, third joint as long as the following three joints united, the outer joints compact. Pronotum strongly transverse, two and one-half times as wide as long, widest along middle, slightly narrower in front than behind; sides obliquely expanded to apical third, then parallel to basal third, and finally strongly concavely attenuate to the posterior angles, which are rectangular; anterior margin arcuately emarginate, without a median lobe; base broadly arcuately emarginate on each side at the elytral lobes, with a broadly rounded median lobe, which is broadly and feebly emarginate in front of scutellum; disk moderately convex, with a very feeble median depression, and on each side of which is a round deep depression in front of elytral lobe, and a deeper transverse one along the anterior margin, there are also two more or less obsolete irregular depressions at the sides; surface coarsely and densely punctate, the punctures irregularly placed, and becoming coarser and confluent at the sides; intervals nearly smooth. Scutellum very long and acuminate at apex, and the surface obsoletely granulose. Elytra wider than pronotum at base, but almost equal in width to it at the middle; sides broadly rounded at humeral angles, nearly parallel to apical third, then arcuately attenuate to the tips, which are obtusely rounded; lateral margins strongly serrate to the humeral angles; humeri moderately prominent; base with a rather acutely rounded lobe; disk feebly convex, and each elytron with four costae, the first extending from apex along suture, and elevated to basal third, where it becomes obsolete, the second feebly elevated, beginning at the posterior fovea, extending forward to near the base, and interrupted by the median fovea, the third feebly elevated and extending from the median fovea to near the apex, and narrowly interrupted by the posterior fovea, and the fourth rather strongly elevated, extending along the lateral margin behind the posterior fovea, but not quite attaining the apex; surface coarsely and densely punctate, the punctures denser and more confluent in the foveae and toward the sides; intervals smooth. Abdomen beneath coarsely and sparsely punctate, with the

posterior margins not well defined, sparsely clothed with long recumbent hairs along sides, and the intervals obsoletely granulose; sides of segments with flat smooth spaces and the posterior angles produced into an acute tooth; first segment feebly concave at middle; last segment with the lateral margins entire, with a strongly elevated serrate submarginal ridge, and broadly, but not deeply arcuately emarginate at apex. Prosternum broadly and obsoletely emarginate in front, without a median lobe; surface transversely depressed along anterior margin, sparsely and rather coarsely punctate, transversely rugose anteriorly, and sparsely clothed with long cinereous hairs; prosternal process flat, strongly expanded behind the coxal cavities, and the apex with a long triangular tooth. Anterior and middle femora moderately robust, the former without the usual large tooth; posterior pair subcylindrical and not enlarged at middle. Anterior and middle tibiae feebly arcuate and subcylindrical; posterior pair straight.

Length, 15 mm.; width, 7.5 mm.

The locality given by Chevrolat (1867) in the original description is Cuba, from the central part of the island in the collections of Gundlach and Poey. Gundlach (1891) records it from Cuba without giving any additional notes.

The above description was made from two female specimens kindly loaned by the Academy Natural Sciences Philadelphia, and labeled Cuba (Poey Coll. No. 986). (One of these specimens has been donated to the U. S. National Museum). There is also a single example of this species labeled No. 839 in the Gundlach Museum in Habana, which has not been available for study.

The species is very closely allied to *tranquebarica* Gmelin and might be easily mistake for that species. It is, however, easily distinguished from that species by the anterior femora not having the usual large tooth on the outer margin, by being broader in proportion to its length, sides of pronotum parallel at middle, posterior foveae on the elytra more irregular and extending between the first and fourth costae, and the last ventral segment of the abdomen in the female broadly, but not deeply arcuately emarginate at the apex, while in *tranquebarica* the female has two semi-circular emarginations at the apex. The species seems to be rare in collections, as no specimens have been recorded except the ones mentioned by Chevrolat in the Gundlach and Poey Collections. It seems to be confined to Cuba, and probably has a different food plant from *tranquebarica*.

CHRYSOBOTHRIIS ANTILLARUM, new species

Female.—Elongate, rather broad and moderately convex, subopaque; head green, with the median parts violaceous-black; pronotum aeneous, with obsolete violaceous-black areas, and anteriorly mar-

gined with green; scutellum and elytra violaceous-black, the latter with the sutural margins green, and each elytron with three deeply depressed green foveae, one at the basal lobe, the second on middle of disk just in front of middle, and the posterior one at apical third, situated closer to the lateral margin than the suture; beneath violaceous-black, with the median parts green.

Head feebly convex, with the front triangular, and the sides feebly arcuately rounded; occiput narrow and obsoletely longitudinally carinate; front with a broad concavity, which is deeper at the epistoma; vertex with an obtuse elevation, not extending to the sides, and behind which, is an obsolete arcuate carina forming an acute arc with the sides of front; surface coarsely and densely punctate, the punctures shallow, irregular and confluent on the front, becoming finer along eyes and on occiput, bottom of punctures finely granulose, and the intervals smooth, sparsely clothed with rather long inconspicuous hairs; eyes large, strongly convex, more acutely rounded at bottom than on top, and separated on the occiput by one-half the distance between the antennal cavities; epistoma very deeply narrowly and acutely emarginate in front, the lobe on each side forming an arc from the bottom of the emargination, and becoming nearly transverse at the sides; antennae moderately long, third joint broad, strongly clavate, and about as long as the following three joints united. Pronotum very strongly transverse, slightly more than two times as wide as long, widest at apical third, narrower behind than in front; sides strongly but not acutely angulate at apical third, then feebly sinuate and strongly obliquely attenuate to the posterior angles, which are nearly rectangular; anterior margin arcuately emarginate, with a broadly rounded obsolete median lobe; base broadly angularly emarginate on each side at elytral lobes, the median lobe broadly rounded, and broadly truncate in front of scutellum; surface somewhat uneven and feebly convex, with a broad obsolete impression at middle, and a smaller oblong one on each side, there is also a broad transverse impression along anterior margin at middle, and the sides are abruptly declivous, the lateral margins sharp, straight, and not visible posteriorly from above, sparsely and deeply punctate, the punctures rather fine on the disk, but becoming coarser and more confluent toward the sides, the surface is also feebly transversely rugose on disk, more irregularly rugose at sides, and the intervals finely and densely granulose. Scutellum very small, triangular, with the sides equal in length and the surface obsoletely granulose. Elytra distinctly wider than pronotum at base; sides broadly angularly rounded at humeral angles, nearly parallel to apical third, then arcuately attenuate to the tips, which are produced into an acute tooth at the middle of each elytron;

lateral margins strongly serrate to the middle; humeri rather prominent; base strongly angularly lobed; surface densely and finely punctate, the punctures becoming coarser, confluent and somewhat rugose at the sides, the intervals finely and densely granulose; each elytron with a distinct longitudinal carina along suture, extending from the apex to middle, and a more obsolete one along the lateral margin, there is a broad shallow impression at the humerus, and three deep round green ones on the disk as mentioned above. Abdomen beneath sparsely and coarsely punctate, the punctures shallow posteriorly, irregularly placed, and from each one arises a rather long erect hair; intervals nearly smooth; first segment broadly, but feebly impressed at middle; last segment with the lateral margins entire, without a submarginal ridge, and the apex with two semi-circular emarginations, the median tooth nearly as long, but more obtuse than the lateral ones. Prosternum with a distinct broadly rounded median lobe in front, behind which, the surface is broadly depressed; surface very coarsely punctured posteriorly, finely, transversely rugose in front, and sparsely clothed with long inconspicuous hairs; prosternal process nearly flat, strongly expanded behind the coxal cavities, and with a large triangular tooth at apex. Femora robust; anterior pair with a large obtuse tooth on the outer edge near middle, which is strongly dentate on the exterior margin. Anterior and middle tibiae arcuate, the former flattened on the inner surface, and without any dilatations; posterior pair straight and subcylindrical.

Length, 12 mm.; width, 5 mm.

Type locality.—Bridgetown, Barbados.

Type.—Coll. Amer. Mus. Nat. Hist.

Described from a single female collected at the type locality by Dayton Stoner on May 11, 1918. It is closely allied to *C. cordicollis* described by Castelnau and Gory from South America. Since their description is so short and incomplete, and the specimen before me does not entirely agree with the description given by these authors, I am describing it as new.

CHRYSOBOTHRIS DENTIPES (Germar)

Buprestis dentipes GERMAR, INS. Spec. Novae, vol. 1, 1824, pp. 38-39, No. 63.

Buprestis characteristica HARRIS, New England Farmer, ser. 1, vol. 8, 1829, p. 2, no. 1.

Chrysobothris dentipes MANNERHEIM, Bull. Soc. Imp. Nat. Moscou, vol. 10, No. 8, 1837, p. 76.

Chrysobothris plicata DEJEAN, Cat. Coleopt., 2 ed., 1833, p. 80; 3 ed., 1836, p. 90. (No description.)

Chrysobothris planata CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, *Chrysobothris*, pp. 56-57, pl. 10, fig. 77.

Chrysobothris posticalis CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837, *Chrysobothris*, p. 56, pl. 10, fig. 76.

Buprestis ruficornis STURM, Catal. Ins. Sammlung, 1826, p. 105.

Chrysobothris ruficornis STURM, Catal. Käfer Sammlung, 1843, p. 61.

Chrysobothris rotundicollis CASTELNAU and GORY, Mon. Bupr., vol. 2, 1837,

Chrysobothris, p. 51, pl. 9, fig 69.

Male.—Form broadly elongate, strongly depressed, and subopaque; color dark aeneous with a cupreous tinge; elytra with numerous irregular smooth costae; antennae aeneous, with joints four to eleven in greater part testaceous; beneath cupreous, and more shining than above.

Head feebly convex, with the front flat and triangular, and the sides obliquely narrowed to the vertex, where they are feebly arcuately expanded; occiput rather wide, with a broad smooth longitudinal carina, which is grooved in the middle; front somewhat uneven, but without distinct impressions; vertex without transverse carina; surface coarsely, densely, and irregularly punctate, the punctures shallow and confluent, forming a network of irregular polygonal areas, the sides of which are smooth and in some places sharply elevated and rugose, rather densely clothed with long, very fine erect hairs, which do not conceal the surface; eyes not very large, narrow, feebly convex, bottom and top about equal in width, but more truncate at the bottom, and separated on the occiput by about the same distance that separates the antennal cavities; epistoma depressed, broadly triangularly emarginate in front, with the lobe on each side strongly angulate at the middle; antennae rather long, third joint only a little longer than the fourth, and the following joints very compact. Pronotum strongly transverse, nearly two times as wide as long, widest at apical third, slightly narrower behind than in front; sides broadly rounded to apical third, then feebly sinuate and obliquely attenuate to the posterior angles, which are rectangular; anterior margin arcuately emarginate, with an obsolete median lobe; base bisinuate, with a very broad median lobe, which is broadly truncate in front of scutellum; surface uneven, the disk moderately convex, with a broad median sulcus, wider in front and limited on either side by a broad elevated smooth space, between which and the margin are two large irregular depressions, one near the anterior margin and the other at base, the latter margined posteriorly with an acutely elevated carina, surface also densely and coarsely punctate, the punctures irregularly placed and becoming confluent in the depressions and at sides. Scutellum small, triangular, with the sides equal in length, and the surface obsoletely granulose. Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, nearly parallel to apical third, then arcuately attenuate to the tips, which are separately, narrowly rounded; lateral margins feebly serrate to the middle, the teeth very short and more closely placed toward the apex; humeri not very

prominent; base broadly rounded, without a distinct lobe; disk rather flat, with a deep basal depression, the first costa along suture distinct on apical half, terminating in front in a vague, smooth space, between this costa and lateral margin are three somewhat transverse, broad smooth spaces of irregular shape, the surface between these is densely, coarsely, and irregularly punctate. Abdomen beneath coarsely but not very closely punctate, the punctures with the posterior margins not well defined, and from the center of each arises a very short inconspicuous hair; intervals nearly smooth; first segment feebly depressed at middle; last segment longitudinally depressed along lateral margins, which are serrate, without a submarginal ridge, and with the apex broadly arcuately emarginate. Prosternum truncate in front and without a median lobe; surface coarsely and sparsely punctate, more densely and finely along the anterior margin, and sparsely clothed with long inconspicuous cinereous hairs; prosternal process nearly flat, strongly expanded behind the coxal cavities, and with a large acute triangular tooth at apex. Femora robust; anterior pair with a large obtuse tooth on the outer edge, closer to the apex than base, and serrate on the exterior margin. Anterior and middle tibiae rather strongly arcuate, flattened on the inner surface and feebly dilated near the apex; posterior pair feebly arcuate and subcylindrical.

Female.—Differs from the male in having the head a little more convex, more coarsely punctured, not as pubescent, and with more or less distinct smooth callosities; last abdominal segment with a very small acute emargination at apex; anterior and middle tibiae only feebly arcuate and the posterior pair straight.

Length, 10–18 mm.; width, 4–7 mm.

This species is easily distinguished from any other species of this genus found in the West Indies by the antennae having joints four to eleven in the greater part distinctly testaceous.

The species was described by Germar (1824) from North America, and later under a number of names as given above by various authors. The species is rather common and is found throughout the greater part of the United States, the larvae living in various species of pine. Castelnau and Gory (1837) described *rotundicollis* from Saint Domingo, and the following is a translation of their original description:

Dark aeneous, strongly punctured. Thorax rounded on the sides, with two elevated longitudinal lines, more obscure at the middle. Elytra with irregular, cupreous impressions, of which the two most prominent are situated a little posteriorly. Body and feet cupreous. Length, 6 lines; width, $2\frac{1}{4}$ lines.

A specimen received from the British Museum and labeled Haiti, Saunders 74–18, agrees with the figure and description of *rotundi-*

collis, although their description is short and does not include the essential characters used at present for separating the species of this genus. In comparing this specimen with specimens of *dentipes* Germar from the United States, I can not find any differences. These authors¹⁹ give a figure of a species which they have identified as *dentipes* Germar, but it is certainly not the species described by Germar from North America, and since Castelnau and Gory apparently did not know the true *dentipes*, I am inclined to place *rotundicollis* as a synonym of *dentipes* Germar. There is a unique specimen under the name *rotundicollis* in the British Museum, but the specimen has not been examined.

CHRYSOBOTHRIS BELLA, new species

Female.—Form rather broad and moderately convex, and shining; above bright bluish-green, and each elytron ornated with reddish-purpureous markings, all of which are obsoletely separated from the suture, and arranged as follows: One covering basal fourth, arcuately rounded posteriorly, and enclosing the green basal depression and humerus; a rather broad transverse fascia just behind the middle, the margins irregular and expanded both near the suture and lateral margin; and a rather narrow crescent-shaped fascia at apical third, feebly oblique, with the concavity toward the apex; beneath green; tarsi cyaneous.

Head flat, with the front triangular, and the sides obliquely narrowed to apex; occiput narrowly and longitudinally carinate; front broadly and irregularly impressed, the impression causing an obsolete transverse elevation near vertex, in front of which the impression is deeper, and extending longitudinally on each side to the antennal cavities; surface very coarsely and irregularly punctate, and the front sparsely clothed with short inconspicuous hairs; intervals finely and densely granulose; eyes large, strongly convex, more arcuately rounded at bottom than on top, and separated on the occiput by about one-half the distance between the antennal cavities; epistoma broadly angularly emarginate in front, and the lobes broadly rounded; antennae short, third joint as long as the following four joints united. Pronotum strongly transverse, nearly two times as wide as long, widest near apex, slightly narrower behind than in front; sides rather strongly angulated near apex, slightly sinuate at middle, then feebly arcuately rounded to posterior angles, which are rather acute and closely applied to the elytra; anterior margin feebly arcuately emarginate, with an obsolete median lobe; base very strongly angularly emarginate on each side at the elytral lobes, the median lobe broadly rounded, and truncate in front of

¹⁹ Mon. Bupr., vol. 2, 1837, *Chrysobothris*, p. 52, pl. 9, fig. 70.

scutellum; surface evenly convex, without impressions, but transversely rugose, and coarsely, sparsely punctate, the punctures irregularly placed, and becoming denser and more oblong toward the sides; intervals finely and densely granulose. Scutellum small, triangular, with the sides equal in length, and the surface obsoletely granulose. Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, nearly parallel to middle, then strongly, arcuately attenuate to the tips, which are produced into an acute tooth at the middle of each elytron; lateral margins strongly serrate to middle, with the teeth rather widely separated; humeri moderately prominent; base strongly angularly lobed; surface without costae, but each elytron with a round deep impression behind the basal lobe, as shallow one near humerus, and with a very feeble impression on the median and postmedian green fasciae, sparsely and regularly punctate, the punctures much coarser and denser on the green fasciae, and becoming nearly obsolete at the apex; intervals finely and densely granulose. Abdomen beneath coarsely and very irregularly punctate; first and second segments feebly depressed at middle; last segment with the lateral margins entire, without a serrate submarginal ridge, and the apex with two deep semicircular emarginations, with the median tooth as long as the lateral ones. Prosternum with a narrow declivous lobe at middle; surface sparsely, coarsely punctate, and somewhat rugose, and sparsely clothed with recumbent cinereous hairs; prosternal process flat, strongly expanded behind the coxal cavities, and with a triangular tooth at apex; anterior coxal cavities separated by about their own diameter. Femora robust; anterior pair armed with a large rounded tooth on outer margin near middle, the tooth with a double row of fine teeth on its exterior margin. Anterior tibiae flattened, feebly arcuate, and without any dilatations; middle and posterior pairs subcylindrical and straight.

Length, 7–9.5 mm.; width, 3.2–4 mm.

Type locality.—Mustique Island, Grenadines, W. I. (H. H. Smith).

Other localities.—Woburn (south end), Grenada, W. I. (H. H. Smith).

Type.—British Museum.

Paratype.—Cat. No. 26808, U.S.N.M.

Described from two females received from the British Museum. The type is from Mustique, and the paratype, which only differs from the type in being smaller, is from Woburn, both specimens having been collected by H. H. Smith. The species is very closely allied to *pulchra* Castelnau and Gory described from South America, without any definite locality. Not having any specimens of *pulchra* for comparison, and on account of the authors' descriptions being

so short and incomplete, I am obliged to describe it as a new species. In their description of *pulchra* they state that the pronotum has a small longitudinal line at the middle, which is entirely absent in the West Indian specimens. In comparing the specimen with their figure of *pulchra*, that species seems to be larger and more elongate, the pronotum not angulate near the anterior angles, and with a longitudinal line at middle, the reddish fasciae on elytra are broader in comparison to the green areas, and the tips of the elytra are conjointly acute, while in *bella* each elytron is produced into an acute tooth at middle.

CHRYSOBOTHRI QUADRIMACULATA (Fabricius)

Buprestis quadrimaculata FABRICIUS, Gen. Ins. Mant., 1776, pp. 236-237; Spec. Ins., vol. 1, 1781, p. 280; Mant. Ins., vol. 1, 1787, p. 183.—OLIVIER, Entomol., vol. 2, gen. 32, 1790, p. 76, pl. 10, fig. 110; Ency. Method., vol. 5, 1790, p. 238.—FABRICIUS, Syst. Eleuth., vol. 2, 1801, p. 208.

Male.—Form rather elongate and moderately convex, subopaque; head aeneous, with a cupreous reflection; pronotum violaceous, with a transverse green fascia at the anterior margin, the fascia narrowly margined anteriorly with a reddish-cupreous color, and a rather wide transverse reddish-cupreous fascia (strongly expanded at the sides) at basal third; scutellum and elytra violaceous; each elytron with base, suture, lateral margin, and a narrow transverse postmedian fascia green, all the green areas narrowly margined with a reddish-cupreous color; there is also a transverse oblong reddish-cupreous spot in the middle of the anterior violaceous area, and a smaller, somewhat triangular spot of the same color in the middle of the posterior violaceous area; beneath aeneous, with a strong bluish-green tinge, the sides of the posterior coxae and prosternum reddish-cupreous and more shining than above; tarsi cyaneous.

Head flat, with the front triangular, and the sides feebly arcuately rounded; occiput narrowly obsoletely longitudinally carinate; front not impressed; vertex with an arcuate transverse elevation forming an arc with the sides of the front; surface sparsely, very coarsely, but not deeply punctate, the punctures irregularly placed, becoming confluent in some parts, and from the center of each puncture arises a moderately long recumbent cinereous hair; intervals finely densely granulose; eyes large, strongly convex, more acutely rounded at bottom than on top, and separated on the occiput by one-half the distance between the antennal cavities, epistoma broadly arcuately emarginate in front, the lobes broadly rounded; antennae short, third joint as long as the following four joints united. Pronotum strongly transverse, one and one-half times as wide as long, widest near apex, front and base about equal in width; sides strongly, abruptly and

arcuately expanded near apical angles, then feebly sinuate, and nearly parallel to the posterior angles, which are rather acute and closely applied to the elytra; anterior margin feebly arcuately emarginate, with an obsolete median lobe; base strongly angularly emarginate on each side at the elytral lobes, the median lobe broadly rounded and truncate in front of scutellum; surface evenly convex, without impressions, sparsely and rather deeply punctate, the punctures irregularly placed and becoming coarser toward the sides; intervals densely, obsoletely granulose. Scutellum very small, triangular, with the sides equal in length and the surface obsoletely granulose. Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, nearly parallel to behind the middle, then arcuately attenuate to the tips, which are conjointly broadly rounded; lateral margins strongly serrate to near the middle, the teeth rather widely separated; humeri rather prominent; base not very strongly lobed; surface without costae, but each elytron with a rather shallow impression at the basal lobe, and a shallow transverse one along base extending to the humerus, and with a broad obsolete impression on the anterior reddish-cupreous area, sparsely, finely and irregularly punctate, the punctures irregular in size, and the intervals finely and densely granulose. Abdomen beneath sparsely and coarsely punctate, the punctures very shallow, irregularly placed, and from each puncture arises a recumbent cinereous hair; intervals obsoletely granulose and more shining than above; first segment only obsoletely flattened; last segment with the lateral margins entire, without a serrate submarginal ridge, and with the apex broadly arcuately emarginate. Prosternum with a narrow, declivous lobe in front, and the surface more coarsely and deeply punctate than the abdomen; prosternal process flat, strongly expanded behind the coxal cavities, and with a triangular tooth at apex; anterior coxal cavities separated by about their own diameter. Femora robust; anterior pair with a sharp tooth on the outer edge near middle, the tooth not serrate on the exterior margin. Anterior tibiae slightly arcuate, feebly flattened and without any dilatations; posterior and middle pairs nearly straight and subcylindrical.

Female.—Differs from the male in having the head more cupreous, and the apex of the last abdominal segment with two semicircular emarginations, and the median tooth more obtuse and not as long as the lateral ones.

Length, 8.5 mm.; width, 3.9 mm.

This beautiful species can be easily separated from all the other West Indian species of this genus by the transverse green, violaceous and reddish-cupreous fasciae on pronotum.

The original locality given by Fabricius (1776) is "India" and from the short description it would be impossible to recognize the

species, but Olivier (1790) gives a very good description and figure of the species described by Fabricius. Fabricius (1801) under *quadrimaculata* cites Olivier's redescription of this species, so there is scarcely any doubt as to Olivier's identification of the species. Specimens which agree with the description and figure given by Olivier have been examined from the following localities. Coll. British Mus.: One female, labeled West Indies, without any definite locality. Coll. Amer. Mus. Nat. Hist.: Two males, labeled Jamaica. (One of these specimens donated to the U. S. Nat. Mus. Coll.)

CHRYSOBOTHRIIS LEPIDA Castelnau and Gory

Chrysobothris lepida CASTELNAU and GORY, Mon. Bupr., vol. 2, 1836, p. 16. pl. 3, fig. 23.—JACQUELIN DUVAL, in Ramon de la Sagra's Hist. Phys. Polit. et Nat. de l'île de Cuba, Anim. Artic., 1857 (French Edition), p. 64; (Spanish Edition) vol. 7, 1857, p. 28.—CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 585 (separates p. 161).—GUNDLACH, Contribution à la Entom. Cuba, vol. 3, pt. 5, 1891, p. 168, No. 505.

Male.—Form broadly elongate, moderately convex and subopaque; head cupreous, with the reliefs purplish-green; pronotum, scutellum, and elytra purpureous, with a distinct greenish tinge; each elytron ornated with bright green marks as follows: A transverse fascia at base, a slightly oblique one just in front of middle, and a more transverse one at apical third, the fasciae wider and more rounded internally, not reaching to the suture, and the posterior one sometimes divided into two round spots; beneath greenish-black, with a strong purpureous tinge, and more shining than above; antennae cupreous; tarsi cyaneous.

Head feebly convex, with the front triangular and the sides feebly arcuately rounded; occiput narrow and longitudinally carinate; front not impressed; vertex with an obsolete arcuate transverse elevation, forming an arc with the sides of the front; surface densely and coarsely punctate, the punctures somewhat confluent on the front and from the center of each puncture arises an inconspicuous cinereous hair; intervals obsoletely granulose; eyes large, strongly convex, more acutely rounded at bottom than on top, and separated on the occiput by about the same distance that separates the antennal cavities; epistoma deeply, narrowly, and acutely emarginate, the lobe on each side forming an arc from the bottom of the emargination; antennae short, third joint about as long as the following three joints united. Pronotum strongly transverse, one and four-fifths times as wide as long, widest near apex, slightly narrower at base than in front; sides strongly, abruptly, and acutely expanded near apical angles, then feebly sinuate and slightly narrowed to the posterior angles, which are nearly rectangular and closely applied to the elytra; anterior margin broadly arcuately emarginate with a

broadly rounded median lobe; base broadly arcuately emarginate on each side at the elytral lobes, the median lobe broadly rounded, and truncate in front of scutellum; surface evenly convex, without impressions, rather densely, deeply, and coarsely punctate, the punctures becoming larger and more confluent at the sides; intervals densely and obsoletely granulose. Scutellum very small, triangular, the sides equal in length, and the surface obsoletely granulose. Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, nearly parallel to near apical third, where they are slightly wider, then arcuately attenuate to the tips, which are conjointly broadly rounded; lateral margins strongly, coarsely serrate to near the middle; humeri not prominent; base broadly arcuately lobed; surface without costae, but each elytron with a round, deep impression at the basal lobe, and a broad, shallow one on the premedian green fascia, densely and finely punctate, the punctures coarse and more confluent on the green areas and at sides and apex; intervals finely and densely granulose. Abdomen beneath sparsely and coarsely punctate, the punctures shallow and irregularly placed, and from each puncture arises a short semierect cinereous hair; intervals nearly smooth and more shining than above; first segment not impressed at middle; last segment with the lateral margins entire, with an obsolete serrate submarginal ridge, and the apex broadly arcuately emarginate. Prosternum with a narrow, broadly rounded median lobe, which is feebly declivous in front, the surface more coarsely and deeply punctate than the abdomen; prosternal process flat, angularly emarginate between the coxal cavities, then strongly expanded on each side, with a rather acute tooth at apex; anterior coxal cavities separated by a little more than their own diameter. Femora robust; anterior pair with a large, acute tooth on the outer edge near middle, the tooth not serrate on the exterior margin. Anterior and middle tibiae slightly arcuate, the former flattened and with an obsolete dilatation at the apex; posterior pair subcylindrical and straight.

Female.—Differs from the male in having the head olivaceous-green, occiput more strongly carinate, eyes more widely separated, first and second abdominal segments feebly flattened, last ventral segment truncate at apex, with a sharp tooth at each side, and an irregular submarginal ridge, and the anterior tibiae without any dilatations.

Length, 6 mm.; width, 3 mm.

Described from Cuba by Castelnau and Gory. Recorded from the same island by Jacquelin Duval. Chevrolat (1867) records it from the eastern and central part of Cuba, in the collections of Gundlach, Poey, and the author. Gundlach (1891) records having collected it in all parts of the island of Cuba and in Porto Rico. The specimens

which he records from Porto Rico are probably *Chrysobothris wolcottii* Fisher, as no specimens of *lepida* have been seen from that island.

Specimens have been examined from the following localities. Coll. U. S. Nat. Mus.: Cayamas, Cuba, January to June (E. A. Schwarz); Long Island, Bahamas, January 4, 1879 (E. A. Schwarz). Coll. Acad. Nat. Sci. Phila.: Cuba (Poey Coll. No. 117). Coll. Amer. Mus. Nat. Hist.: Banon San Vicente (near Viñales), Cuba, elevation about 1,000 feet in a valley in the Sierra de los Organos, September 16, 1913, the vegetation consisting of palms, guava, and many other shrubs and trees (Chas. W. Leng). Coll. S. C. Bruner: Santiago de las Vegas, Cuba, January 18, 1922 (S. C. Bruner). The species is also represented in the Gundlach Museum in Habana by two examples labeled No. 505, and by a single example in the British Museum, neither of which have been examined.

CHRYSOBOTHRIS MEGACEPHALA Castelnau and Gory

Chrysobothris megacephala CASTELNAU and GORY, Mon. Bupr., vol. 2, 1836, p. 13, pl. 3, fig. 18.

Male.—Form rather elongate, moderately convex and subopaque; color uniformly dark aeneous; each elytron with four round, deep impressions, which are slightly more aureous or cupreous at the bottom; tarsi aeneo-piceous.

Head feebly convex, with the front triangular and the sides obliquely narrowed to the vertex; occiput moderately wide and obsoletely longitudinally carinate; front not impressed; vertex with a transverse elevation; surface densely and coarsely punctate, the punctures on the front rather shallow, irregular, and nearly confluent, the sides forming a network of polygonal areas, the bottom of which are granulose, rather densely clothed with long semi-erect silvery-white hairs, which do not obscure the surface; eyes large, strongly convex, more acutely rounded at bottom than on top and separated on the occiput by slightly less than the distance between the antennal cavities; epistoma narrowly and deeply emarginate in front, the lobe on each side forming an arc from the bottom of the emargination; antennae rather long, third joint about as long as the following four joints united. Pronotum strongly transverse, nearly two times as wide as long, widest at apical third, apex and base about equal in width; sides very strongly angulated at apical third, then slightly arcuately rounded and feebly narrowed to posterior angles, which are rather acute; anterior margin arcuately emarginate, with an obsolete median lobe; base rather strongly arcuately emarginate on each side at the elytral lobe, with the median lobe broadly rounded, and truncate in front of scutellum; surface

evenly convex, without impressions, rather densely and deeply punctate, the punctures well separated on the disk, but becoming coarser and somewhat confluent at the sides; intervals obsoletely granulose. Scutellum small, triangular, the sides equal in length and the surface obsoletely granulose. Elytra distinctly wider than the pronotum at base; sides broadly rounded at humeral angles, slightly sinuate and nearly parallel to behind middle, where they are slightly wider, then arcuately attenuate to the tips, which are conjointly broadly rounded; lateral margins strongly serrate to the middle, the teeth short and widely separated; humeri not very prominent; base arcuately lobed; surface without costae, but each elytron with a round deep impression at basal lobe, a broad obsolete one at humerus, a round deep one on middle of disk just in front of the middle, and two round ones placed transversely at apical third, the interior one not as deeply impressed, densely and rather deeply punctate, the punctures rather fine on the disk but becoming coarser and more confluent toward the sides; intervals densely and finely granulose. Abdomen beneath coarsely and rather densely punctate, the punctures very shallow, irregularly placed, and becoming finer toward the sides, sparsely clothed with long recumbent cinereous hairs; intervals obsoletely granulose; first segment feebly depressed at middle; last segment with the lateral margins entire, with an obsolete serrate submarginal ridge, and the apex broadly arcuately emarginate, with a very small acute notch on each side at the apical angles. Prosternum with a distinct median lobe in front, behind which the surface is abruptly and broadly depressed and sparsely and very irregularly punctate; prosternal process flat, strongly expanded behind the coxal cavities, and with a large triangular tooth at apex. Femora robust; anterior pair with a large acute tooth on the outer edge at middle, which is not serrate on the exterior margin. Anterior tibiae arcuate, flattened, and with a distinct broad dilatation at apex; middle pair strongly sinuate near apex; and the posterior pair straight and subcylindrical.

Female.—Differs from the male in having the front of head more convex and the sides feebly arcuately rounded, apex of abdomen with two semi-circular emarginations (the median tooth not as long as the lateral ones), anterior tibiae without dilatations, and the middle pair straight.

Length, 9 mm.; width, 4 mm.

This species is closely allied to *chlorosticta* Thomson, and *parvofoveata* Fisher, but can be distinguished from either of these two species by the elytral foveae being cupreous or concolorous with the elytra, and the four posterior ones transversely placed, while in the

first two species the foveae are green, and the posterior ones obliquely placed.

The locality given by Castelnau and Gory in their original description of this species is Port-au-Prince, Haiti, and the above description was made from specimens from the type locality. Specimens have been examined from the following localities. Coll. U. S. Nat. Mus.: Port-au-Prince, Haiti; Higueral, Santo Domingo, February, 1916 (E. G. Smyth); Santa Rita, Porto Rico, July, 1913 (E. G. Smyth). Coll. H. F. Wickham: Port-au-Prince, Haiti (R. J. Crew). Coll. British Mus.: St. Domingo. Coll. Amer. Mus. Nat. Hist.: Ensenada, Porto Rico, May, 1915, Breeds in *Agati grandiflora* (E. G. Smyth). Coll. Porto Rico Exp. Sta.: Higueral, Santo Domingo, April 13, 1913 (W. V. Tower). Coll. Mus. Comp. Zool.: St. Marc, Haiti (W. M. Mann).

Kerremans²⁰ places *octosignata* described by Waterhouse²¹ as a synonym of this species, but I have been unable to find that Waterhouse has used that name for a species of *Chrysobothris*.

CHRYSOBOTHRIIS CHLOROSTICTA Thomson

Chrysobothris chlorosticta (Laferté Mss.) THOMSON, Typ. Buprestidarum, 1878, p. 78.

Male.—Form rather elongate, moderately convex, and subopaque; above aeneous, with a strong purpureous tinge; each elytron ornated with bluish-green markings as follows: A large round spot at basal lobe, an oblong spot on humerus, and extended to the base, a large round ante-median spot, and two small round spots at apical third, of which the exterior one is placed obliquely in advance of the anterior one; dorsal segments of abdomen bright green at the sides; beneath aeneous, with purpureous and cupreous reflections; tarsi cyaneous.

Head feebly convex, with the front triangular and the sides obliquely narrowed to the vertex; occiput rather wide and longitudinally carinate; front not impressed; vertex with a transverse elevation; surface densely and coarsely punctate, the punctures on the front shallow, irregular, and nearly confluent, the sides forming a network of polygonal areas, the bottom of which are granulose, sparsely clothed with long, recumbent cinereous hairs; eyes large, strongly convex, more acutely rounded at bottom than on top, and separated on the occiput by about the same distance as between the antennal cavities; epistoma with a narrow acutely rounded emargination at middle, the lobe on each side of the emargination obliquely rounded; antennae rather long, third joint about as long as the following four

²⁰ Wytzman's Gen. Insectorum, fasc. 12, pt. 3, 1903, p. 191.

²¹ Biol. Centr.-Amer., Coleopt., vol. 3, pt. 1, 1887, p. 88.

joints united. Pronotum strongly transverse, nearly two times as wide as long, widest near apical third, slightly narrower behind than in front; sides very strongly angulated near apical third, then feebly sinuate and obliquely narrowed to the posterior angles, which are rather acute; anterior margin arcuately emarginate, with a broadly rounded obsolete median lobe; base arcuately emarginate on each side at the elytral lobe, the median lobe broadly rounded, and truncate in front of scutellum; surface evenly convex, without impressions, rather densely and deeply punctate, the punctures well separated on the disk, but becoming coarser and more confluent toward the sides; intervals obsoletely granulose. Scutellum small, triangular, the sides equal in length, and the surface obsoletely granulose. Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, slightly sinuate and parallel to behind middle, then arcuately attenuate to the tips, which are conjointly broadly rounded; lateral margins strongly serrate to the middle, the teeth large, widely and irregularly placed; humeri not very prominent; base broadly arcuately lobed; surface without costae, but with all the green spots deeply impressed, except those on the humeri, rather densely, deeply, and regularly punctate, the punctures becoming somewhat confluent and rugose toward the sides; intervals densely and finely granulose. Abdomen beneath coarsely, sparsely, and irregularly punctate, and very sparsely clothed with long, recumbent, cinereous hairs; intervals obsoletely granulose; first segment feebly impressed at middle; last segment with the lateral margins entire, with an obsolete serrate submarginal ridge, and the apex broadly but not deeply arcuately emarginate. Prosternum with a distinct median lobe in front, behind which the surface is abruptly and broadly depressed, with only a few coarse punctures along the sides, and sparsely clothed with long cinereous hairs; prosternal process flat, nearly smooth, strongly expanded behind the coxal cavities, and with a very large triangular tooth at apex. Femora robust; anterior femora with a large acute tooth on the outer edge near the middle, the exterior margin not serrate. Anterior tibiae feebly arcuate, flattened on the inner margin, and with a distinct dilatation near the apex; middle pair strongly sinuate near apex; posterior pair straight, subcylindrical, and with a series of stiff hairs on the outer margin near apex.

Female.—Differs from the male in having the front of head slightly more convex, sides more arcuately rounded, elytral spots of a brighter green color, and the posterior ones larger, sides of pronotum more concave posteriorly, apex of abdomen with two semicircular emarginations (the median tooth not as long as the lateral ones), anterior tibiae without dilatations, and the middle and posterior ones straight.

Length, 10.5 mm.; width, 4.25 mm.

This species is closely allied to *megacephala* Castelnau and Gory, and *parvofoveata* Fisher. From the former it is distinguished by the elytral markings being green and the posterior foveae placed obliquely on the elytron, and from the latter by having the humeral angles green, elytral spots larger, and the epistoma more acutely emarginate at the middle.

The above description of the male was made from a specimen labeled "St. Domingo," in the collection of the British Museum, and that of the female, in the collection of the American Museum of Natural History, collected by F. W. Watson at Villa Rivas, 20 miles west of Sanchez, Dominican Republic, on June 19, 1915. The collecting was done along the north bank of the Ura River to a point one mile east of the town. The locality given by Thomson in the original description is simply "St. Domingo."

CHRYSOBOTHRI PARVOFOVEATA, new species

Female.—Form rather elongate, moderately convex, and sub-opaque; color uniformly dark aeneous; each elytron with four small, round spots, which are deeply impressed, bright green at the bottom, and arranged as follows: One at the basal lobe, a similar one just in front of the middle, and two others near the apical third, of which the exterior one is considerably in advance of the interior one; tarsi cyaneous.

Head rather strongly convex, with the front triangular, and the sides feebly arcuately rounded; occiput wide, with a broad smooth longitudinal carina; front not impressed; vertex with an obsolete transverse elevation; surface densely and coarsely punctate, the punctures somewhat confluent near the antennal cavities, sparsely clothed with long, inconspicuous cinereous hairs; intervals obsoletely granulose; eyes large, strongly convex, more acutely rounded at bottom than on top, and separated on the occiput by about the same distance as between the antennal cavities; epistoma broadly angularly emarginate in front, the lobe on each side broadly rounded; antennae rather short, third joint about as long as the following three joints united. Pronotum strongly transverse, nearly two times as wide as long, widest at apical third, slightly narrower behind than in front; sides very strongly angulated at apical third, then feebly sinuate, and obliquely attenuate to the posterior angles, which are rather acute; anterior margin arcuately emarginate, with a broadly rounded median lobe; base arcuately emarginate on each side at the elytral lobes, the median lobe broadly rounded, and narrowly truncate in front of scutellum; surface evenly convex, without impressions, rather densely and coarsely punctate, the punctures somewhat confluent toward the sides; intervals finely and densely granulose.

Scutellum very small, triangular, with the sides equal in length. Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, nearly parallel to behind the middle, then arcuately attenuate to the tips, which are conjointly broadly rounded; lateral margins strongly serrate to the middle, the teeth large and rather evenly spaced; humeri not prominent; base broadly arcuately lobed; surface with very indistinct longitudinal costae at apex, with eight round deep depressions as noted above, densely and deeply punctate, the punctures becoming denser and confluent toward the sides; intervals finely and densely granulose. Abdomen beneath sparsely, coarsely, and irregularly punctate, and very sparsely clothed with long inconspicuous cinereous hairs; intervals obsolete granulose; first segment broadly depressed at middle; last segment with the lateral margins entire, with an obsolete serrate submarginal ridge, and the apex with two semicircular emarginations, the median tooth only about one-half as long as the lateral ones. Prosternum with a distinct median lobe in front, behind which the surface is abruptly and broadly depressed, and with only a few large, irregularly placed punctures, and very sparsely clothed with long cinereous hairs; intervals smooth; prosternal process flat, strongly expanded behind the coxal cavities, and with a very large triangular tooth at apex. Femora robust; anterior pair with a large acute tooth on outer edge near middle, the exterior margin of which is not serrate. Anterior tibiae arcuate, flattened on the inner surface, and without any dilatations, the middle and posterior pairs straight and subcylindrical.

Length, 9 mm.; width, 3.75 mm.

Type locality.—Port-au-Prince, Haiti.

Type.—Cat. No. 26809, U.S.N.M.

Described from a single female collected at the type locality by R. J. Crew and received through the kindness of H. F. Wickham. I have also examined fragments of this species collected by E. G. Smyth at Higueral, Santa Domingo, during February, 1916.

The species is closely allied to *chlorosticta* Thomson, and *megacephala* Castelnau and Gory. From the former it can be separated by the absence of the green markings on humeral angles of elytra, elytral spots smaller, and the epistoma broadly angularly emarginate. From *megacephala* it can be distinguished by the elytral foveae being green, and the posterior ones placed obliquely on each elytron. It is also allied to *astuta* described by Waterhouse from Mexico, but the pronotum is more strongly angulated anteriorly than in that species, and the elytral foveae are green.

CHRYSOBOTHRIIS THOMAE Kerremans

Chrysobothris thomae KERREMANS, ANN. SOC. ENT. BELG., vol. 43, 1899, p. 337.

Female.—Form, small, short, and feebly convex, subopaque; head, pronotum and scutellum dark aeneous, the reliefs on pronotum somewhat purpureous; elytra violaceous-black, basal region irregularly and obsoletely variegated aeneous, viridis and cupreous, the base, suture and lateral margins narrowly margined with green, the green margin becoming broader on the suture posteriorly and narrowly margined with a bright cupreous-red color along base and anterior part of suture, a broad irregular green premedian fascia extending from the lateral margin to middle of disk, but not reaching the suture, a broad post-median reddish-cupreous fascia extending between the green lateral and sutural margins, and a narrow preapical green fascia, narrowly margined posteriorly with a bright reddish-cupreous color; beneath violaceous-black, slightly aeneous in front, and more shining than above.

Head flat, with the front triangular and the sides broadly arcuately rounded; occiput very narrow, and longitudinally carinate; front and vertex without any impressions or carinae; surface very coarsely and densely punctate, the punctures shallow and confluent, with the bottoms finely and densely granulose, rather sparsely clothed with moderately long, recumbent cinereous hairs; eyes large, strongly convex, more acutely rounded at bottom than on top, and separated on the occiput by about one-half the distance between the antennal cavities; epistoma broadly angularly emarginate in front, with the lobes broadly rounded; antennae short, third joint a little longer than the following two joints united, cupreous, and sparsely pubescent. Pronotum strongly transverse, one and two-fifths times as wide as long, widest near apical fourth, slightly narrower behind than in front; sides rounded behind apical angles, then feebly, arcuately attenuate to the posterior angles, which are obtusely rounded; anterior margin obsoletely arcuately emarginate, with a feebly broadly rounded median lobe; base strongly bisinuate, with the median lobe broadly rounded, and truncate in front of scutellum; surface evenly convex, without any impressions, rather strongly transversely rugose, and rather coarsely and sparsely punctate, the punctures deep and well separated; intervals finely and densely granulose. Scutellum small, triangular, with the sides equal in length, and surface finely granulose. Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, and feebly expanded to just behind the middle, where they are the widest, then strongly arcuately attenuate to the tips, which are separately narrowly rounded; lateral margins strongly serrate to near the middle; humeri not very prominent; base angularly lobed; surface

without costae, but each elytron with a round deep impression behind the basal lobe, and a shallow transverse impression along base, connected to a broader impression at humerus, the pre-median green fascia is also feebly impressed, rather densely and coarsely punctate, the punctures somewhat irregular but well separated, the intervals densely and finely granulose. Abdomen beneath coarsely and sparsely punctate; last segment with the lateral margins entire, with a serrate submarginal ridge, and truncate at apex. Prosternum with a narrow, declivous lobe in front; surface densely coarsely punctate, and sparsely clothed with recumbent cinereous hairs; prosternal process flat, strongly constricted between the coxal cavities, and long and acute at apex; anterior coxal cavities separated by about their own diameter. Femora robust; anterior pair armed with an acute tooth on the outer edge near middle, and with a series of small sharp teeth between the large tooth and apex. Anterior tibiae slightly arcuate near base, with a distinct dilatation on inner surface near the middle; middle and posterior pairs straight.

Length, 6.5 mm.; width, 3.25 mm.

This beautiful little species was described by Kerremans from St. Thomas, Antilles, and the above description is made from a specimen kindly loaned by the British Museum and labeled "S. Thomas (Meyer Dür); thomae Kerr. Type."

CHRYSOBOTHRIIS WOLCOTTI, new species

Chrysobothris lepida GUNDLACH (not Castelnau and Gory), An. Soc. Espan. Hist. Nat., ser. 2, vol. 22, 1894, p. 623.

Male.—Form broadly elongate, moderately convex, and subopaque; head bright green; pronotum purplish or feebly cupreous, with the anterior margin narrowly margined with green, and with two obsolete aureous spots on the disk, one on each side of the median line and slightly in front of the middle; scutellum green; elytra purpureous, and each elytron ornated with the following bright green markings: A narrow transverse fascia at base, narrowly connected at the suture and along lateral margin to a narrow transverse fascia at basal third; a similar fascia at apical third extending from the lateral margin to near the suture, where it is bent backward, but not reaching the suture; and an oblong spot at the apex; beneath greenish-black, becoming purplish toward the sides, with the prosternum and exterior surface of the anterior femora and tibiae bright green, and the surface glabrous.

Head feebly convex, with the front triangular, and the side feebly arcuately rounded; occiput very narrow, longitudinally carinate and densely punctate; vertex and front nearly flat, without any longitudinal carina or sulcus, but with an obsolete transverse carina between the vertex and occiput; surface densely and coarsely punc-

tate, the punctures rather shallow, irregular, and nearly confluent, the sides forming a network of polygonal areas, bottom of the punctures granulose, and from the center of which arises an inconspicuous white hair; eyes large, strongly convex, more acutely rounded at bottom than on top, and separated on the occiput by about one-third the distance between the antennal cavities; epistoma large, broadly and very deeply triangularly emarginate at middle, the anterior margin strongly angulated on each side of the emargination; antennae greenish at base, becoming aeneous toward the tip, third joint about equal in length to the following three joints united. Pronotum strongly transverse and moderately convex, one and one-half times as wide as long, widest near the apical angles, then feebly obliquely narrowed to the posterior angles, which are not very acute; anterior margin arcuately emarginate, with a broadly rounded, obsolete median lobe; base deeply emarginate at middle of each elytron, with a broadly rounded median lobe, which is feebly truncate in front of scutellum; surface evenly convex, without impressions, coarsely transversely rugose, and finely, rather sparsely, punctate, the punctures elongate and widely separated, the intervals very finely granulose. Scutellum triangular, the sides equal in length and the surface granulose. Elytra distinctly wider than pronotum at base, feebly angulated at humeral angles, then feebly sinuate and nearly parallel to near the middle, where it is the widest, and then arcuately attenuate to the tips, which are separately and rather broadly rounded; lateral margins very strongly serrate to near the middle; base moderately lobed; surface without costae, but with a deep transverse impression along the base, rather coarsely and densely punctate, the punctures elongate and rather widely separated; intervals finely and densely granulose. Abdomen beneath coarsely and sparsely punctate; last segment with the lateral margins entire, with a serrate submarginal ridge, and truncate at apex; with a small deep emargination at the lateral sides, forming an acute tooth at the outer edge. Prosternum broadly lobed in front, surface more coarsely and densely punctate than abdomen. Femora robust; anterior pair with a strong acute tooth on their outer edge near the middle, serrate on its exterior margin. Anterior tibiae slightly arcuate, with a distinct dilatation near the middle; middle and posterior pairs straight.

Female.—Differs from the males in having the front of head purplish, with the bottom of the punctures and margins along eyes slightly bronzy, and the punctures on front more widely separated, causing the intervals to be wider and obsolete granulose, antennae aeneous with a strong purplish tinge; elytra more strongly angulated and sinuate near the humeral angles; beneath uniformly greenish-black

becoming strongly purplish toward the sides, and with the last abdominal segment more serrate at apex and the two lateral teeth projecting farther beyond the median part than in the male.

Length, 6–7 mm.; *width*, 2.5–3 mm.

Type locality.—Mayaguez, Porto Rico.

Other localities.—Rio Piedras and Anasco, Porto Rico.

Type and allotype.—Cat. No. 26810, U.S.N.M.

Paratypes.—British Museum and Collection Porto Rico Experiment Station.

Described from four specimens, two males and two females. The type is from Mayaguez, Porto Rico, without any additional data. The allotype was received from G. N. Wolcott of the Porto Rico Experiment Station, and was collected at Rio Piedras, Porto Rico, July 23, 1916, by E. G. Smyth, on a living twig of jobo (*Spondia lutea*). There is also a male paratype in the British Museum Collection from Anasco, Porto Rico, collected September, 1913, by E. G. Smyth, and a female paratype in the Porto Rico Experiment Station collection from Rio Piedras, Porto Rico, collected November 25, 1912, by G. Nevarrete.

This species was recorded by Gundlach (1894) from Porto Rico as *lepida* Castelnau and Gory, but it is entirely different from that species. It is allied to *Chrysobothris lepida* Castelnau and Gory from Cuba, and also to *C. chrysoela* Illiger from the United States. From both these species it differs by having the epistoma triangularly emarginate, eyes more widely separated on occiput, pronotum more strongly transversely rugose, and the sides less strongly narrowed posteriorly, the last abdominal segment truncate, the transverse green fascia on basal third of elytron connected along the suture and lateral margin to the basal fascia, and the green fascia at apical third slightly turned backward near the suture, while in *lepida* and *chrysoela* the green markings usually consist only of spots and are never connected along suture or lateral margin.

CHRYSOBOTHRIS HISPANIOLAE, new species

Female.—Form small, short, rather robust and feebly convex, and subopaque; head aeneous in front, becoming cupreous on the occiput; pronotum reddish-cupreous; elytra brownish-aeneous, and each elytron ornated with bright green markings as follows: A transverse spot along base enclosing a round deep basal depression, a round deeply depressed spot on middle of disk, situated just in front of middle, and an oblong feebly impressed spot at apical third, situated closer to the lateral margin than the suture, the median and posterior green spots are narrowly margined with violaceous; beneath piceous, with a strong aenous tinge; tarsi cyaneous.

Head feebly convex, with the front triangular, and the sides feebly arcuately rounded; occiput narrow, and longitudinally carinate; front not impressed; vertex with a very feeble arcuate elevation; surface sparsely and finely punctate, the punctures deep, widely separated, and regular in size, sparsely clothed with rather short inconspicuous hairs; intervals densely and rather coarsely granulose; eyes large, strongly convex, more acutely rounded at bottom than on top, and separated on the occiput by about one-half the distance between the antennal cavities; epistoma broadly and deeply triangularly emarginate in front, with the lobe on each side strongly angulated at the middle; antennae short, the third joint not as long as the following two joints united. Pronotum strongly transverse, one and one-half times as wide as long, widest at apical third, slightly narrower behind than in front; sides broadly rounded anteriorly, then arcuately attenuate to the posterior angles, which are rather obtuse; anterior margin feebly arcuately emarginate; base rather strongly bisinuate, with the median lobe broadly rounded, and feebly truncate in front of scutellum; surface evenly convex, without impressions, but sparsely and finely punctate, the punctures deep, elongate, and well separated on the disk, becoming coarser and transversely rugose at the sides; intervals finely and densely granulose. Scutellum small, triangular, the sides equal in length, and the surface obsoletely granulose. Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, nearly parallel to behind middle, where they are slightly wider, then arcuately attenuate to the tips, which are separately narrowly rounded; lateral margins coarsely serrate to the middle, the teeth very short and widely separated; humeri prominent; base feebly angularly lobed; surface with an obsolete costa along the lateral margin, extending from behind the humerus to near the apex, each elytron with a deep round impression at basal lobe, a feebly impressed one at humerus, an elongate one along margin behind the humerus, a round deeply impressed green spot on disk in front of middle, and a feebly impressed green spot at apical third, densely and coarsely punctate, the punctures irregular and becoming somewhat confluent at the sides; intervals densely and coarsely granulose. Abdomen beneath coarsely, deeply, and irregularly punctate, intervals obsoletely granulose, and more shining than above; first segment not impressed at middle; last segment with the lateral margins entire, with a submarginal ridge, and the apex subtruncate. Prosternum with a small rounded lobe in front; surface very sparsely and coarsely punctate; prosternal process flat, triangularly expanded behind the coxal cavities, and with a very short obtuse tooth at apex. Femora robust; anterior pair with a large acute tooth on

the outer edge, closer to the apex than base, and not serrate on the exterior margin. Anterior tibiae arcuate, feebly flattened on the inner surface, and without any dilatations; middle and posterior pairs straight and subcylindrical.

Length, 4.5 mm; width, 2.1 mm.

Type locality.—Port-au-Prince, Haiti.

Type.—Cat. No. 26811, U.S.N.M.

This species was described from a single female received from H. F. Wickham, and was collected by R. J. Crew at the type locality. It is closely allied to *C. thoracica* Fabricius, but differs from it in a number of ways. The head is more finely punctured, more strongly granulose, and the sides of the punctures not forming a network of polygonal areas as in *thoracica*. The pronotum is more arcuately attenuate posteriorly, the punctures on disk more elongate, and widely separated; and the elytra has an obsolete costa along the lateral margin, the basal foveæ more rounded and deeply impressed, the green basal fascia not extended along the suture behind the scutellum, and the disk with four round green foveæ, the median ones deeply impressed.

CHRYSOBOTHRI THORACICA (Fabricius)

Buprestis thoracica FABRICIUS, Ent. Syst. Suppl., 1798, p. 138.

Buprestis amabilis HERBST, Nat. Syst. Ins. Käfer, vol. 9, 1801, pp. 144-145, pl. 147, fig. 5.

Male.—Form small, short, rather robust and feebly convex, and subopaque; head bright green, with the reliefs on front cupreous; pronotum reddish-cupreous with the anterior margin aureous; scutellum dark green; elytra brownish-aeneous, and each elytron ornated with nile-green markings as follows: A broad fascia along base, extending backward for a short distance along suture, this fascia is also extended around the humeral angle, an irregular transverse spot in front of middle, and a small post-median spot, which is closer to the lateral margin than the suture; there is also a black spot behind the humerus and a similar one along the lateral margin at middle. Beneath piceous, with a strong aeneous tinge at middle, and becoming aeneo-purpureous at the sides of abdomen; prosternum green, becoming cupreous at the sides; legs violaceous, the anterior femora green on the exterior surface.

Head feebly convex, with the front triangular and the sides feebly arcuately rounded; occiput narrow and longitudinally carinate; front not impressed; vertex with an obsolete transverse arcuate elevation, forming an arc with the sides of the front; surface densely and coarsely punctate, the punctures rather shallow, irregular, and nearly confluent, the sides forming a network of polygonal areas, bottom of punctures granulose, and from the center of which arises

a rather long inconspicuous hair; eyes large, strongly convex, more acutely rounded at bottom than at top, and separated on the occiput by about one-half the distance between the antennal cavities; epistoma deeply and narrowly emarginate in front, the lobe on each side forming an arc from the bottom of the emargination; antennae short, cupreous, the third joint about as long as the following two joints united. Pronotum strongly transverse, one and three-fourths times as wide as long, widest at apical third, slightly narrower behind than in front; sides broadly rounded anteriorly, then obliquely attenuate to the posterior angles, which are rather obtuse; anterior margin feebly arcuately emarginate; base rather strongly bisinuate, with the median lobe broadly rounded and feebly truncate in front of scutellum; surface evenly convex and without impressions, densely and coarsely punctate, the punctures rather deep and well separated; intervals finely and densely granulose. Scutellum small, triangular, the sides equal in length, and the surface obsoletely granulose. Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, nearly parallel to behind middle, where they are slightly wider, then arcuately attenuate to the tips, which are separately narrowly rounded; lateral margins coarsely serrate to middle, the teeth very short and widely separated; humeri prominent; base feebly angularly lobed; surface without costae, but each elytron with a deep round impression at basal lobe, a broader but more shallow one at humerus, an obsolete one along margin behind humerus, and a broad obsolete impression on the antemedian green area, coarsely, densely, and irregularly punctate, the punctures somewhat confluent toward the apex; intervals densely and coarsely granulose. Abdomen beneath coarsely, deeply, and irregularly punctate; intervals obsoletely granulose and more shining than above; first segment not impressed at middle; last segment with the lateral margins entire, with an obsolete serrate submarginal ridge, and the apex feebly truncate. Prosternum with a narrow rounded lobe in front; surface more densely punctured than abdomen; prosternal process flat, triangularly expanded behind the coxal cavities, and with a very small obtuse tooth at apex; anterior coxal cavities separated from each other by about their own diameter. Femora robust; anterior pair with a large acute tooth on the outer edge, closer to the apex than base, and finely serrate on the exterior margin. Anterior tibiae feebly arcuate near base, somewhat flattened, and with an obsolete dilatation on inner margin near apex; middle and posterior pairs straight and subcylindrical.

Length, 5.4 mm.; width, 2.5 mm.

This species was described by Fabricius (1798) from the Island of St. Thomas, and the above description was made from a specimen from the type locality, kindly loaned by the British Museum. Herbst

(1801) described and figured the same species from an unknown locality under the name *amabilis*.

In the U. S. National Museum collection are two specimens from Porto Rico, which I have placed under this species, one collected by G. B. Merrill at Guanica, April 15, 1914, and the other by E. G. Smyth at Santa Rita, during July, 1913. The specimen from Guanica is a male, of the same size as the specimen from the type locality, and only differs from it in a few minor details. The elytral markings, with the exception of the basal ones, are aeneous, and the blackish area is more extended on the disk. The specimen from Santa Rita is a female and is larger than the other specimens, measuring 6.25 mm. in length and 2.75 mm. in width, the head is cupreous in front and a little more convex, elytral markings about the same as specimen from Guanica, the under side is uniformly piceous, the first abdominal segment feebly impressed at middle, and the last segment more broadly rounded at the apex.

CHRYSOBOTHRIIS INSULANA, new species

Female.—Form broadly elongate, moderately convex, and subopaque; head and pronotum aeneous, with a slight cupreous tinge; scutellum and elytra reddish-cupreous, the latter somewhat purpureous on disk, and each elytron ornated with bluish-green spots as follows: A rather broad fascia extending from basal depression transversely along the base and around the humeral angles, an oblong depressed spot on disk just in front of middle, an irregular transverse fascia at apical third, extending from the lateral margin to the disk but not reaching the suture, a small spot covering the apical area; beneath piceous, with a slight aeneous or greenish tinge, and more shining than above, the elytral epipleura cupreous; tarsi cyaneous.

Head feebly convex, with the front triangular and the sides feebly arcuately rounded; occiput narrow, and feebly longitudinally carinate; front not impressed; vertex with an obsolete arcuate transverse elevation forming an arc with the sides of the front; surface densely and coarsely punctate, the punctures very shallow, without well-defined sides, and from each arises a short recumbent cinereous hair; intervals densely and rather coarsely granulose; eyes large, reniform, strongly convex, more acutely rounded at bottom than on top, and separated on the occiput by about one-third the distance between the antennal cavities; epistoma broadly triangularly emarginate in front, with the lobes broadly rounded; antennae short, the third joint only slightly longer than the following two joints united. Pronotum strongly transverse, one and two third times as wide as long, widest near middle, and the base and apex

about equal in width; sides regularly arcuately rounded; anterior margin broadly arcuately emarginate, without a median lobe; base broadly arcuately emarginate on each side at elytral lobe, with the median lobe broadly rounded, and truncate in front of scutellum; posterior angles rather obtuse; surface evenly convex, and without impressions, rather densely and regularly punctate, the punctures rather deep, well separated, and becoming somewhat coarser toward the sides; intervals finely and densely granulose. Scutellum very small, triangular, the sides equal in length, and the surface obsoletely granulose. Elytra distinctly wider than pronotum at base; sides broadly rounded at humeral angles, nearly parallel to apical third, where they are slightly wider, then arcuately attenuate to the tips, which are separately broadly rounded; lateral margins rather strongly serrate to near the middle; humeri not very prominent; base broadly arcuately lobed; surface without costae, but each elytron with a round deep basal impression, a shallow one at humerus, a long narrow one along lateral margin behind humeral angles, a large round deeper impression in the ante-median green area, and a smaller one in the post-median green fascia, densely and regularly punctate, the punctures rather deep and well separated on the disk, but becoming obsolete in the humeral areas; intervals densely and rather coarsely granulose. Abdomen beneath sparsely and coarsely punctate, the punctures shallow, irregularly placed, and from each arises a short inconspicuous cinereous hair; intervals obsoletely granulose; first segment not impressed at middle; last segment with the lateral margins entire, with an obsolete serrate submarginal ridge, and the apex broadly subtruncate. Prosternum with a narrow declivous lobe in front; surface more deeply punctured than the abdomen; prosternal process flat, strongly expanded behind the coxal cavities, and with a triangular tooth at apex; anterior coxal cavities separated by about their own diameter. Femora robust; anterior pair with a large acute tooth on the outer edge, closer to the apex than base, and finely serrate on the exterior margin. Anterior tibiae feebly arcuate, strongly flattened, without any dilatations, the middle and posterior pairs straight and subcylindrical.

Length, 6 mm.; width, 3 mm.

Type locality.—Jamaica.

Type.—British Museum.

Described from a single female kindly loaned by the British Museum and labeled Jamaica, without a definite locality.

It is closely allied to *Chrysobothris lepida* Castelnau and Gory, but can be easily distinguished from that species by the pronotum having the sides arcuately rounded and not angulated anteriorly. It is also related to *C. wolcottii* Fisher from Porto Rico, but in

insulana the pronotum is arcuately rounded and widest near the middle, the elytral markings are smaller, and the basal and median ones not connected along the suture.

CHRYSOBOTHRISEXFASCIATA Schaeffer

Chrysobothris seafasciata SCHAEFFER, Journ. N. Y. Ent. Soc., vol. 26, 1918, pp. 212-213.

Male.—Form small, short, rather robust and feebly convex, and subopaque; head cupreous, with a strong aeneous tinge, the occiput and margins along eyes green; pronotum and elytra dark purpureous, with a feeble greenish tinge, each elytron ornated with golden-green markings as follows: A transverse basal fascia extending along the lateral margin and connected to a feebly oblique ante-median fascia, which does not reach the suture, a rather broad irregular transverse fascia at apical third, which does not extend to the suture nor lateral margin, and a small spot covering the apical region. Beneath piceous, with the sides of the abdominal segments bright green, and the legs purpureous, with a strong aenous tinge on the exterior surface of the anterior femora; antennae cupreous; tarsi cyaneous.

Head feebly convex, with the front triangular and the sides rather strongly arcuately rounded; occiput narrow, and feebly longitudinally carinate; vertex with an arcuate elevation forming an arc with the sides of the front; surface coarsely and densely punctate, the punctures shallow, nearly confluent, with the sides not well defined, and the intervals densely and rather coarsely granulose, from each puncture arises a rather moderately long, semierect, cinereous hair; eyes large, strongly convex, more acutely rounded at bottom than on top, and separated on the occiput by about one-half the distance between the antennal cavities; epistoma deeply and broadly triangularly emarginate in front, with the lobe on each side strongly angulated at middle; antennae short, the third joint about as long as the following two joints united. Pronotum strongly transverse, two times as wide as long, widest at middle, and slightly narrower in front than behind; sides arcuately rounded; anterior margin arcuately emarginate, and without a median lobe; base rather strongly bisinuate, the median lobe broadly rounded, and truncate in front of scutellum; surface evenly convex, and without impressions, rather densely, but not coarsely punctate, the punctures deep, and well separated on disk, becoming coarser and confluent at sides, and separated by obsolete rugae near the posterior angles; intervals densely and coarsely granulose. Scutellum small, triangular, the sides equal in length, and the surface obsoletely granulose. Elytra distinctly wider than pronotum at base; sides broadly

rounded at humeral angles, nearly parallel to behind middle, where they are slightly wider, then arcuately attenuate to the tips, which are separately narrowly rounded; lateral margins coarsely serrate to middle, the teeth short, and widely separated posteriorly; humeri rather prominent; base feebly angularly lobed; disk without longitudinal costa, but with an obsolete longitudinal costa along lateral margin, extending from the humeri to post-median green fascia, with a deep basal depression, and a more obsolete one at humeri and on green ante-median fascia; surface coarsely and densely punctate; intervals coarsely and densely granulose. Abdomen beneath coarsely punctate, with the posterior and anterior margins of the segments smooth, the intervals finely and densely granulose, more shining than above, and the sides of the segments with smooth obsolete nodules; first segment not impressed at middle; last segment with the lateral margins entire, with an obsolete submarginal ridge, and the apex subtruncate. Prosternum with an obsolete lobe in front; surface rather coarsely and densely punctate; prosternal process flat, triangularly expanded behind the coxal cavities, and with a very short obtuse tooth at apex. Femora robust; anterior pair with a sharp acute tooth on the outer edge, closer to the apex than base, and not serrate on the exterior margin. Anterior tibiae feebly arcuate, flattened on the inner surface, and without any dilatations; middle and posterior pairs straight and subcylindrical.

Length, 4.25 mm.; width, 2 mm.

This species was originally described from Key West, Florida, by Schaeffer from a female specimen. Two males from Cuba in the United States National Museum have been examined, one collected at Cayamas, June 23, by E. A. Schwarz, and the other received from H. F. Wickham and simply labeled Cuba. There is also a specimen in the collection of S. C. Bruner, collected at Camaquey, Cuba, July 20, 1923, by J. Acuña.

Mr. Schaeffer has kindly compared the Cuban specimen with his type in the Brooklyn Museum and writes that it only differs from the type in having the head more metallic green above and the abdominal segments metallic green at the sides. The type being a female, and the specimen from Cuba a male, would account for this slight color difference.

CHRYSOBOTHRISEXFASCIATA, var. JAMAICENSIS, new variety

Female.—This variety differs from the typical species by the head being entirely purpureous, with only a slight aeneous tinge, sides of the pronotum more parallel and not as arcuately rounded, and the lateral margins more rounded and not as sharply defined; elytra not as densely nor deeply punctate, the punctures becoming obsolete toward the apex, the green spots more bluish, and the antemedian

one larger, more oval, and not connected along the lateral margin to the transverse basal fascia, the discal spots more strongly impressed, surface more obsoletely granulose, and the lateral margins more strongly serrate. Abdomen beneath more coarsely and sparsely punctate, the punctures very shallow and without well-defined margins, and the sides of the segments without smooth nodules.

Length, 4.25 mm.; width, 2 mm.

Type locality.—Kingston, Jamaica.

Type.—Cat. No. 26812, U.S.N.M.

This variety is described from a single female collected by Frank R. Mason at Liguanea Plain, Kingston, Jamaica, on July 5, 1920. Through the kindness of Mr. Mason the type has been deposited in the National Museum collection.

Genus *DICERCA* Eschscholtz

Dicerca ESCHSCHOLTZ, Zool. Atlas, vol. 1, 1829, p. 9 (reprint p. 8).

Dicerca LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 35-36.—CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, pp. 93-108, pls. 24-27.—KERREMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 3, 1903, pp. 130-133.

Stenuris KIRBY, Richardson's Fauna Bor Amer., vol. 4, 1837, pp. 154-156.

Head flat, rugose, and slightly wider in front than on vertex; front not narrowed by the insertion of the antennae; epistoma short and emarginate in front; antennal cavities small and rounded, situated at a considerable distance from the inner margin of the eyes in a deep triangular depression, which is surrounded on two sides by a strongly elevated carina. Antennae short and slender, extending to about the middle of pronotum; first joint short and clavate; second and third shorter and more slender, and about equal in length; fourth longer than third, and feebly triangular; following joints triangular, dentate on the inner side, and armed with a poriferous fovea, situated on the inferior side at the apical margin of the joint. Eyes rather small, oval, about two times as long as wide, feebly convex, and closer together on the vertex than at the front. Pronotum wider than long, more or less longitudinally grooved or carinate at the middle; sides variable, sometimes constricted behind, with the posterior angles acute; base bisinuate. Scutellum very small, rounded or subquadrangular. Elytra elongate, sinuate at posterior coxae, and strongly acuminate posteriorly, often produced into a tail-like process; apex unarmed, sinuate or bidentate. Sternal cavity formed by the mesosternum and metasternum; mesosternum divided, the lateral branches somewhat elongate; metasternum rounded in front and feebly grooved at middle. Prosternum flat, concave or grooved; anterior margin declivous, sinuate or bilobed; prosternal

process not strongly constricted by the anterior coxal cavities and broadly rounded or acuminate at apex. Posterior coxae strongly dilated internally; anterior margin sinuate; posterior margin arcuately emarginate and strongly attenuate to the lateral margin. Legs rather robust, femora fusiform, the anterior and middle ones more strongly swollen at middle than the posterior pair; tibiae straight and cylindrical, the anterior pair spatulate at apex; tarsi rather broad; first joint of posterior pair not longer than the following joint. Abdomen with the suture between the first and second segments distinct; first segment flat, concave or longitudinally grooved; last segment variable. Body elongate, oval, rather convex, always acuminate or bifurcate at apex.

This is not a very large genus, containing only about 40 described species, and which are confined to the Palaearctic and Nearctic Regions. The two species recorded in the present paper from the West Indies are certainly not indigenous to these islands, but have been introduced at various times through commerce. The two species can be separated by the following characters.

KEY TO THE SPECIES

Pronotum and elytra very uneven, the latter with distinct smooth elevated spaces-----tuberculata Castelnau and Gory.
 Pronotum and elytra not distinctly uneven, the latter with only obsolete elevated spaces-----divaricata (Say).

DICERCA TUBERCULATA Castelnau and Gory

Dicerca tuberculata CASTELNAU and GORY, Mém. Bupr., vol. 2, 1838, *Buprestis*, p. 99, pl. 25, fig. 135.—CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 577 (separates p. 153).—GUNDLACH, Contribution à la Entom. Cuba, vol. 3, pt. 5, 1891, pp. 159-160, No. 1542.

Dicerca hilaris LECONTE, Trans. Amer. Philos. Soc., new ser., vol. 11, 1859, p. 200.

Dicerca manca LECONTE, Trans. Amer. Philos. Soc., new ser., vol. 11, 1859, p. 201.

Female.—Form rather narrowly elongate, attenuate behind, and moderately convex; above uniformly cupreous, sometimes with a greenish tinge, and the reliefs smooth and more brownish-cupreous; beneath more reddish-cupreous.

Head feebly convex and very uneven; surface coarsely, densely and deeply punctate, the punctures irregular in size, confluent and forming a number of smooth elevated rugae, sparsely clothed with short, inconspicuous hairs; epistoma broadly arcuately emarginate in front; eyes oblong, about two times as long as wide, and feebly converging above. Pronotum nearly two times as wide as long, widest at the apical third, apex and base about equal in width; sides strongly obliquely expanded from apex to apical third, where they

are strongly angularly rounded, then broadly arcuately emarginate, and strongly attenuate to the posterior angles, which are nearly rectangular; anterior margin broadly arcuately emarginate, with a broadly rounded median lobe; base feebly bisinuate; disk very uneven, with four shining, elevated irregular vittae, the lateral ones broader and strongly interrupted behind the middle, and the median ones enclosing a small shining callus at the middle, there is also an irregular elevation extending forward from the posterior angles; surface coarsely, densely, and confluent punctate in the depressions. Scutellum small, sub-quadrate and finely granulose. Elytra wider than pronotum at base, broadly rounded behind humeri, strongly sinuate at basal third, broadly expanded behind middle, then strongly attenuate to the tips, which are slightly expanded and divergent, and rounded or subtruncate at apex; surface uneven, with numerous irregular smooth elevated spaces, the depressions densely, coarsely, and confluent punctate, with a few deeper punctures intermixed, which are green at the bottom, and tend to form striae on the disk. Abdomen beneath coarsely, rather sparsely and irregularly punctate, and sparsely clothed with a few short recumbent hairs; intervals obsoletely granulose; first segment obsoletely flattened at middle; last segment elongate, acutely rounded at apex, and the surface not bicostate. Prosternum feebly convex, broadly transversely depressed anteriorly, and without elevated costae; surface densely, coarsely, and confluent punctate, and sparsely clothed with short inconspicuous hairs; anterior margin truncate; prosternal process broadly sulcate at middle, feebly expanded behind the anterior coxal cavities, then strongly attenuate to apex, which is broadly rounded.

Length, 15 mm.; width, 6.5 mm.

This species was described by Castelnau and Gory (1838) from North America. It is distributed over the eastern part of the United States, but because of much confusion in the identification of the species of this genus, it is difficult to give its distribution.

Chevrolat (1867) records it from North America; Havana, Cuba; and Senegal, and states that it has, without doubt been imported into the two last countries in lumber. In the collections of Chevrolat, Gundlach, and Poey. Gundlach (1891) records it from Habana, Cuba, as having been introduced from the United States.

This species is not represented in the Poey collection in Philadelphia, but there is a single example labeled No. 842 in the Gundlach Museum in Habana.

No specimens of this species have been examined from the West Indies, and the above description was made from a specimen from the United States, which agrees fairly well with Castelnau and Gory's short description.

DICERCA DIVARICATA (Say)

Buprestis divaricata SAY, Journ. Acad. Nat. Sci., Phila., vol. 3, 1823, pp. 163-164.

Dicerca dubia MELSHEIMER, Proc. Acad. Nat. Sci., Phila., vol. 2, 1844, p. 142.

Dicerca aurichalcea MELSHEIMER, Proc. Acad. Nat. Sci., Phila., vol. 2, 1844, pp. 142-143.

Dicerca parumpunctata MELSHEIMER, Proc. Acad. Nat. Sci., Phila., vol. 2, 1844, p. 143.

Male.—Form more broadly elongate than *tuberculata*, attenuate behind, and moderately convex; above aeneo-cupreous, with the tips of elytron usually more reddish, and the surface with obscure and blackish elevations; beneath slightly more reddish-cupreous than above.

Head feebly convex, and obsoletely concave at middle; surface coarsely and very densely punctato-rugose, the punctures somewhat irregular and confluent, with the bottoms bright green, sparsely clothed with long, inconspicuous hairs; eyes oblong, about two times as long as wide, and feebly converging above; epistoma broadly, and rather deeply arcuately emarginate in front. Pronotum nearly two times as wide as long, widest near middle, slightly narrower in front than behind; sides strongly obliquely expanded from apex to near middle, where they are strongly rounded to basal third, then nearly parallel to the posterior angles, which are nearly rectangular, anterior margin feebly arcuately emarginate, with a broadly rounded median lobe; base feebly bisinuate; disk obsoletely sulcate at middle, more deeply impressed anteriorly, and with a deep prescutellar fovea, and on each side, there is usually a more or less oblique impression behind the middle; surface coarsely and rather densely punctate, the punctures somewhat confluent, irregularly placed, and forming irregular smooth elevations. Scutellum small, subquadrate, and finely striolate. Elytra wider than pronotum at base, feebly rounded behind humeri, sinuate at basal third, then strongly arcuately attenuate to near the tips, where they are parallel and slightly divergent, the apex subtruncate, with the sutural angle acutely produced; surface rather even, with two short longitudinal costae at the apex of each elytron, the exterior one being the longer, striato-punctate, the striae not deeply impressed, and becoming obsolete toward the sides, with the punctures coarse and well separated, intervals coarsely and irregularly punctate, the punctures in some areas confluent and forming areolae, which are not very well defined. Abdomen beneath coarsely and rather densely punctate, the punctures irregularly placed, and with the posterior margins not very well defined, and sparsely clothed with long, fine recumbent hairs; intervals smooth; first segment very broadly and rather deeply concave at middle; last

segment rather elongate, and acuminate posteriorly, with the apex deeply and rectangularly emarginate, the surface with two obsolete costae. Prosternum feebly convex, surface very coarsely and densely punctate, and sparsely clothed with long, erect, inconspicuous hairs; anterior margin bisinuate; prosternal process wide, deeply and broadly sulcate at middle, the sides smooth and extending forward to near the anterior margin, with the bottom of the sulcus transversely rugose, sides parallel to behind the anterior coxal cavities, then strongly obliquely attenuate to the apex, which is broadly rounded.

Female.—Differs from the male in having the head more sparsely punctate; abdomen beneath more sparsely pubescent, the first segment not as deeply concave at middle, last segment deeply arcuately emarginate at apex, with a distinct tooth at the middle of the emargination, and the surface more distinctly bicostate; prosternal process not deeply sulcate at middle, with the median part coarsely, densely punctate, and very sparsely pubescent.

Length, 17–20 mm.; width, 5.5–6.5 mm.

This species was originally described by Say (1823) from the United States. It is rather abundant throughout the northeastern part of North America from Canada to Kentucky and westward to Wisconsin, the larvae living in a great variety of deciduous trees.

The admission of the species in the present paper is based on two specimens received from the British Museum and labeled "Haiti, Saunders 74-18," which were probably introduced in lumber from the United States.

A number of species described by Casey²² have been placed as synonyms of this species by Leng,²³ but since the types of these species have not been examined, they are omitted from the synonymy in the present paper.

Genus PARACINYRA, new genus

Head nearly flat, wider in front than on vertex; front not narrowed by the insertion of the antennae; epistoma short and emarginate in front; antennal cavities small, rounded, and partially covered by an elevated carina, and situated a considerable distance from the inner margin of the eyes. Antennae rather short and slender, extending to about the middle of the pronotum; first joint elongate and feebly clavate; second short and slightly elongate; third more slender, cylindrical, and about two times as long as the second; the following joints triangular, dentate on the inner side, and armed with a poriferous fovea situated on the inferior side at apical margin of the joint. Eyes rather broadly oval, nearly two times as long as

²² Proc. Wash. Acad. Sci., vol. 11, 1909, pp. 144–149.

²³ Cat. Coleopt. North America, 1920, p. 180.

wide, strongly convex, feebly projecting, and closer to each other on the vertex than at the front. Pronotum wider than long, wider in front than behind; anterior margin and base more or less bisinuate; sides feebly attenuate posteriorly; disk without a longitudinal median sulcus. Scutellum small, transverse, and not acuminate posteriorly. Elytra elongate, strongly attenuate posteriorly, and acuminate at apex. Sternal cavity formed by the mesosternum and metasternum; mesosternum divided, the lateral branches rather small, elongate, and feebly oblique; metasternum feebly emarginate in front and with a very narrow groove at the middle. Prosternum moderately wide, convex, with the anterior margin rounded; prosternal process feebly constricted by the anterior coxal cavities, and rather acuminate at apex. Posterior coxae about equally dilated internally and at the sides; anterior margin strongly bisinuate; posterior margin deeply arcuately emarginate at the middle. Legs moderately robust; femora slightly swollen at middle; tibiae straight and subcylindrical; tarsi short, first joint of posterior pair only slightly longer than the second; tarsal claws with an obtuse tooth at the base. Abdomen with the suture between the first and second segments distinct. Body narrow, subcylindrical, and strongly acuminate posteriorly.

Genotype.—*Paracinyra viridimaculata*, new species.

This genus is closely allied to *Cinyra* Castelnau and Gory, but it is much narrower and more cylindrical in form, pronotum wider in front than behind, and not distinctly sulcate at the middle, tips of the elytron strongly acuminate, prosternal process more strongly expanded behind the anterior coxal cavities, and the first joint of the posterior tarsi only slightly longer than the second joint.

PARACINYRA VIRIDIMACULATA, new species

Form narrow and subcylindrical, broadly rounded in front, and strongly acuminate behind; head purpureous, with a strong greenish tinge, and with the epistoma and a narrow margin along the eyes aureo-cupreous; pronotum purpureous, strongly greenish when viewed in certain lights, and with the anterior margin and a rather broad longitudinal median band aureo-cupreous; scutellum reddish-cupreous; elytra purpureous, with a strong greenish tinge when viewed in certain lights, and each elytron ornamented with aureo-viridis markings as follows: A narrow band along the base extending along the lateral margin for a short distance and also along the suture to the basal fourth; an irregular subtriangular spot at basal third, feebly oblique but not extending to the suture nor lateral margin; a narrower band at apical third, which is transverse laterally and bent obliquely forward internally, the spot not extending to the lateral margin nor to the suture; there is also a longitudinal triangu-

lar spot at the apex. Beneath purpureous, with a strong greenish or bluish tinge, more shining than above, and with the sides of the abdomen aureo-cupreous.

Head nearly flat, with a broad longitudinal sulcus, which is narrower and more deeply impressed on the vertex, and becoming more obsolete toward the epistoma; surface glabrous, coarsely and densely punctate, the punctures rather shallow and very irregularly placed, the intervals smooth and shining; epistoma broadly and deeply arcuately emarginate in front, forming a broad obtuse tooth on each side of the emargination. Pronotum one and three-fourths times as wide as long, slightly wider in front than behind, widest at apical fourth; sides feebly arcuately expanded from anterior margin to apical fourth, then slightly obliquely narrowed to the posterior angles, which are rectangular; anterior margin nearly truncate, with an obsolete median lobe; base feebly bisinuate, the median lobe only feebly indicated; disk regularly convex, with a very short narrow groove terminating in a deep puncture in front of the scutellum; surface coarsely, deeply, and densely punctate, the punctures irregularly placed, distinctly separated on the disk, but becoming somewhat confluent at the sides, and with an irregular, longitudinal smooth median space, extending from the anterior margin to basal third, where it is replaced by the longitudinal groove, the intervals finely and densely granulose. Scutellum oblong, nearly two times as wide as long and with the surface obsoletely granulose. Elytra about as wide as pronotum at base, strongly acuminate posteriorly, allowing the abdomen to be plainly visible from above on the apical half; humeral angles obtusely angulated; sides feebly expanded behind the humeral angles, slightly attenuate to the apical third, where they are obsoletely arcuately rounded, then strongly, obliquely attenuate to the tips, which are very acute, the lateral margins obsoletely serrate posteriorly; surface striato-punctate, the striae not impressed, becoming more or less confused posteriorly, and the punctures large, rather deep, and irregularly placed in the striae, the intervals flat, transversely rugose, and with numerous irregularly placed punctures similar to those in the striae. Abdomen beneath strongly convex, rather finely, sparsely punctate, and sparsely clothed with a few short recumbent cinereous hairs; intervals obsoletely granulose; first abdominal segment convex at middle, last segment subtruncate at apex. Prosternum feebly transversely concave along anterior margin, which is broadly arcuately rounded, the surface sparsely, coarsely punctate, with a few very short cinereous hairs, and the intervals smooth on the median parts, but becoming strongly granulose at the sides; prosternal process flat, without a longitudinal sulcus, the sides slightly concave to behind the anterior coxal cavities, where they are feebly ex-

panded, then obliquely attenuate to the apex, which is rather acutely rounded.

Length, 10 mm.; width, 3.5 mm.

Type locality.—Guantanamo, Cuba.

Type.—Coll. Amer. Mus. Nat. Hist.

This beautiful species was described from a single example collected by Chas. T. Ramsden at the type locality on June 18, 1916. Superficially it resembles one of the larger species of the genus *Agrius*, but it is easily separated from any species of that genus by having the lateral branches of the mesosternum elongate and not concealed by the prosternum.

Genus CINYRA Castelnau and Gory

Cinyra CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, pp. 157-160, pl. 89.—LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 45-46.—KERREMANS, Wytzman's Gen. Insectorum, fasc. 12, pt. 3, 1903, pp. 137-138.

Cynira SAUNDERS, Catal Bupr., 1871, p. 47.

Leptia (part) DEJEAN, Cat. Coleopt., 2 ed., 1833, p. 78; 3 ed., 1836, p. 89.
(No described species included.)

Head flat or feebly convex, wider in front than on vertex; front not narrowed by the insertion of the antennae; epistoma short and emarginate in front; antennal cavities small, rounded, partially covered by an elevated carina, and situated a considerable distance from the inner margin of the eyes. Antennae rather long and slender, and about as long as the head and pronotum united; first joint elongate, and more or less clavate; second very short and globular; third and fourth elongate; feebly triangular, subequal in length, and about as long as the first; following joints elongate, triangular, dentate on the inner side, gradually decreasing in length to the last joint, and armed with a poriferous fovea situated on the inferior side at apical margin of the joint. Eyes rather small, oval, not two times as long as wide, strongly convex, somewhat projecting, and closer to each other on the vertex than at the front. Pronotum wider than long, narrower in front than behind; base and anterior margin bisinuate; sides subsinuate or obliquely attenuate anteriorly. Scutellum variable, rather small and often wider than long. Elytra elongate, strongly attenuate posteriorly, and obliquely truncate, emarginate or bidentate at apex. Sternal cavity formed by the mesosternum and metasternum; mesosternum divided, the lateral branches elongate and feebly oblique; metasternum rounded in front and feebly grooved at the middle. Prosternum wide, flat; anterior margin straight, sometimes strongly declivous; prosternal process not constricted by the anterior coxal cavities, but strongly acuminate at the apex. Posterior coxae strongly dilated internally; anterior margin straight; posterior margin oblique internally and strongly

arcuately emarginate toward the lateral margin. Legs feebly robust; femora subfusiform, the anterior and middle ones slightly more swollen at middle; anterior tibiae feebly arcuate, the middle and posterior pairs straight and subcylindrical; tarsi rather elongate; first joint of posterior pair subcylindrical and longer than the second. Abdomen with the suture between the first and second segments distinct. Body elongate, slender, and attenuate posteriorly.

This genus at present contains about 24 described species and is confined in its distribution to the western Hemisphere.

Four species have been recorded from the West Indies, all of which are very closely allied and difficult to separate. *C. albonotata* seems to be confined to Haiti, while the other three species have only been recorded from Cuba.

KEY TO THE SPECIES

1. Pronotum distinctly sulcate at middle..... *sulcicollis* Chevrolat.
 Pronotum not or only feebly sulcate at middle..... 2.
2. Elytral foveae concolorous with remainder of surface; elytra nearly parallel behind humeral angles; anterior margin of prosternum declivous and interrupted at middle..... 3.
 Elytral foveae not concolorous with remainder of surface; elytra broadly rounded behind humeral angles; anterior margin of prosternum declivous and not interrupted at middle..... *costulifera* Chevrolat.
3. Elytral foveae rounded, distinctly impressed and regular in size; sides of pronotum parallel posteriorly..... *multipunctata* (Olivier).
 Elytral foveae more irregular, not as distinctly impressed, and more irregular in size and shape; sides of pronotum oblique posteriorly, widest at base..... *albonotata* (Castelnau and Gory).

CINYRA SULCICOLLIS Chevrolat

Cinyra sulcicollis CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 580 (separates p. 156).—GUNDLACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, 1891, p. 163, no. 1418.

The following is a translation of Chevrolat's original description:

Elongate, bronzy green with pupureous reflections; head green, and longitudinally rugose, sulcate behind, with a smooth area between the eyes and a short sulcus above; antennae slender and greenish-blue; eyes fuscous; thorax vaguely punctate, with four violaceous foveae placed quadrangularly, and longitudinally impressed at front and base; scutellum round, smooth, and concave; elytra emarginate at apex, near the suture caniculate posteriorly; each elytron bispinose, outside feebly punctate-striate, and inside sulcate-striate, interstice confusely punctate, with several sparse foveae which produce a costa; body beneath and legs punctate, greenish-blue, the abdomen sparsely clothed with short hairs, and with small glabrous spots at the sides.

Length 15.5 mm.; width, 5 mm.

Cuba, eastern part of the island in July. Collections of Gundlach and Poey.

This species is close to *O. armata* Laporte and Gory, and I place it in that series. It is distinguished from the two preceding (*costulifera* and *multipunctata*) by the groove on the pronotum and by the feebly punctiform impressions on the elytra, which are about eight in number on each elytron.

Chevrolat states that it can be distinguished from the two other Cuban species, *costulifera* and *multipunctata*, by the pronotum being sulcate. Since both of these species have the pronotum feebly sulcate at the middle and were represented in his collection, his species *sulcicollis* is probably broadly and deeply sulcate.

Gundlach (1891) records collecting it at Caimanera, near the Bay of Guantanamo, Cuba.

This species is not represented in the Poey collection in Philadelphia, but there is a single example, labeled No. 1418, in the Gundlach Museum in Habana, which was not available for study.

The species has been placed in the key solely upon the characters given in the original description, as no specimens have been available for study.

CINYRA COSTULIFERA Chevrolat

Cinyra costulifera CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 579 (separates, p. 155).—GUNDLACH, Contribucion à la Entom. Cuba, vol. 3, pt. 5, p. 162, no. 105.

Male.—Form elongate, more robust than *albonotata* or *multipunctata* and more flattened above; head dark aeneo-cupreous, more cupreous at epistoma, and becoming aureo-cupreous on the occiput, bottom of punctures bright green; pronotum and elytra aeneo-cupreous, the latter feebly purplish, with numerous bright cupreous or aureous foveae; beneath aeneo-cupreous, with purplish, greenish, or cyaneous reflections, more shining than above, and the sides of the abdominal segments ornated with sparsely clothed pubescent spots.

Head feebly, evenly convex, without depressions, but with a distinct longitudinal carina on the occiput; front with the sides abliquely converging to the vertex; surface deeply, rather densely and irregularly punctate, with numerous irregular smooth spaces on the front, and sparsely clothed with short inconspicuous hairs; epistoma broadly and deeply arcuately emarginate at middle, the lateral angles of the emargination acutely rounded. Pronotum one and one-half times as wide as long, slightly narrower in front than behind; sides feebly obliquely expanded from anterior margin to apical fourth, then nearly parallel to the posterior angles, which are rather acute; anterior margin nearly truncate, with an obsolete, broadly rounded median lobe; base feebly bisinuate; disk with an obsolete median sulcus, a deep ante-scutellar fovea, and four densely punctured im-

pressions, two at the base and two in front of the middle, forming a transverse quadrangle, the two basal ones more deeply, abruptly and transversely impressed; surface coarsely, deeply and rather densely punctate, the punctures more remote on the post-median part, and the four impressions rather densely clothed with short cinereous hairs. Scutellum rounded, subtruncate in front, and the surface obsoletely striolate. Elytra distinctly wider than pronotum at base, broadly rounded at humeral angles, arcuately expanded to behind humeri, nearly parallel to apical third, then strongly arcuately attenuate to the tips, which are truncate and rather deeply emarginate; surface striate-punctate, the striae feebly impressed, somewhat confused, and interrupted by the foveae, and the punctures in the striae very small and obsolete, intervals flat, and coarsely, rather densely, and irregularly punctate; each elytron with a number of feebly impressed foveae, arranged as follows: First, near scutellum; second, third, and fourth on the second stria, the second one small, and situated at middle, fourth, and fifth larger, one at the apical third, the other at apex; fifth and sixth large, round, and situated between the third and fifth striae, one just in front of middle, the other behind the middle; seventh near humeral angle; eighth behind the humerus; six along the lateral margin, one behind the humerus, one near the apex, and the other four about equally distance apart; all of the impressions rather densely clothed with short fulvous hairs. Abdomen beneath coarsely, rather densely and irregularly punctate, and rather densely clothed with long recumbent cinereous hairs; first segment feebly flattened at middle; last segment truncate at apex, with a deep transverse crescent shaped depression behind the apical margin. Prosternum feebly convex; surface coarsely, sparsely punctate, and nearly glabrous; anterior margin broadly, abruptly and strongly declivous along entire margin; prosternal process feebly convex, parallel to behind anterior coxae, then obliquely attenuate to the apex, which is acutely rounded.

Female.—Similar to the male with the exception that the head is dark aeneo-cupreous, the punctures are not green at the bottom, and the body beneath not quite as pubescent.

Length, 15–17 mm.; width, 5–5.75 mm.

This species is closely allied to *albonotata* and *multipunctata*, but differs from both these species in being more robust and parallel posteriorly, the elytra more broadly rounded behind the humeri, the elytral foveae of a different color from the remainder of the surface, and the anterior margin of the prosternum not interrupted at the middle.

The species was described by Chevrolat (1867) from Cuba, and stated that it was found in the central and eastern part of the island

in the collections of Gundlach and Poey. Gundlach (1891) records it from both parts of Cuba.

The following material has been examined. Coll. Acad. Nat. Sci. Phila.: Cuba (Poey Coll. No. 11). Coll. Amer. Mus. Nat. Hist.: Rio Seco, Guantanamo, Cuba, June 8, 1908 (Chas. T. Ramsden). U. S. Nat. Mus.: Santiago de Cuba. (Donated by the Amer. Mus. Nat. Hist.) There is also a specimen labeled No. 105 in the Gundlach Museum in Habana which has not been examined.

CINYRA MULTIPUNCTATA (Olivier)

Buprestis multipunctata OLIVIER, Entom., vol. 2, gen. 32, 1790, pp. 86-87, pl. 12, fig. 137.—HERBST, Nat. Syst. Ins. Käfer, vol. 9, 1801, pp. 180-181, pl. 151, fig. 7.—JACQUELIN DUVAL, in Ramon de la Sagra's Hist. Phys. Polit. et Nat. de l'île de Cuba, Anim. Artic., 1857 (French edition), p. 61; (Spanish edition) vol. 7, 1857, p. 27.

Anolyochira multipunctata CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, pp. 148-149, pl. 36, fig. 204.

Cinyra multipunctata CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, pp. 579-580 (separates, pp. 155-156).—GUNDLACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, 1891, pp. 162-163, no. 1261.

Form elongate, slender, and moderately convex; head aureo-cupreous; pronotum and elytra cupreous, with a slight aeneous tinge and ornated with numerous cinereous pubescent spots; beneath cupreous, with a strong aeneous or purpureous tinge, more shining than above and the sides of the abdominal segments ornated with small dense cinereous pubescent spots.

Head feebly and evenly convex, without depressions, but with an obsolete longitudinal carina on the occiput; front with the sides obliquely converging to the vertex; surface nearly glabrous, deeply and rather densely punctate, the punctures not quite as coarse but more irregularly placed than in *albonotata*; intervals smooth; epistoma broadly and deeply arcuately emarginate at middle, the lateral angles of the emargination acutely rounded. Pronotum one and two-fifth times as wide as long, slightly narrower in front than behind; sides feebly obliquely expanded from anterior margin to apical fourth, then nearly parallel to the posterior angles, which are nearly rectangular; anterior margin nearly truncate, with an obsolete, broadly rounded median lobe; base feebly bisinuate; disk feebly sulcate at middle, with a deep ante-scutellar fovea, and four densely punctured impressions, two at the base and two in front of the middle, forming a transverse quadrangle, the basal ones more deeply, abruptly, and transversely impressed; surface coarsely, deeply, and rather densely punctured, the punctures more remote on the post-median part and the four impressions and median sulcus rather densely clothed with short cinereous hairs. Scutellum small,

rounded, and the surface obsoletely striolate. Elytra slightly wider than pronotum at base, obtusely rounded at humeral angles, nearly parallel to behind humeri, slightly sinuate at posterior coxae, then arcuately attenuate to the tips, which are truncate and feebly bidentate; surface striato-punctate, the striae more deeply impressed than in *costulifera*, somewhat interrupted by the foveae, and the stria punctures small and obsolete, intervals flat, coarsely, densely, and irregularly punctate, the foveae round, distinct, and the arrangement similar to that of *costulifera*, but clothed with cinereous hairs. Abdomen beneath coarsely, rather densely, and irregularly punctate, and rather densely clothed with long recumbent cinereous hairs; first segment feebly flattened at middle; last segment subtruncate at apex, with a narrow transverse depression behind the apical margin. Prosternum feebly convex; surface coarsely, deeply, and rather densely punctate, and sparsely clothed with fine long, erect, cinereous hairs; anterior margin broadly but not abruptly declivous on each side of the middle; prosternal process flat, parallel to behind the anterior coxal cavities, then obliquely attenuate to the apex, which is acutely rounded.

Female.—Similar to the male, except that the head is dark aeneo-brunneus, and the prosternum and abdomen beneath not quite as pubescent.

Length, 11.5–13 mm.; width, 3.75–4 mm.

This species resembles *albonotata* in general form, but the sides of the pronotum are more parallel and the disk more distinctly sulcate at the middle, the elytra more distinctly striate, and the elytral foveae larger, rounder, and more distinctly defined.

This species was originally described by Olivier (1790) from Sweden, but the locality being questionable, and later recorded by Castelnau and Gory (1838) from Habana, Cuba. Jacquelin Duval (1857) recorded it as having been found in Habana. Chevrolat (1867) recorded it from Cuba, and stated that material was in the collections of Gundlach, Poey, and Chevrolat. Gundlach (1891) records collecting it in the vicinity of "Bahia Honda y en la *Fermína*," Cuba.

The following material has been examined. Coll. British Mus.: One specimen labeled simply "Cuba." U. S. Nat. Mus.: Cuba (Chevrolat Coll.) (donated by the British Museum). The species is not represented in the Poey collection in Philadelphia, but there are two examples labeled No. 1261 in the Gundlach Museum in Habana which have not been seen by the writer.

CINYRA ALBONOTATA (Castelnau and Gory)

Ancylochira albonotata CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, p. 149, pl. 36, fig. 205.

Male.—Form elongate, slender, and moderately convex; head aureo-viridis, becoming cupreous on the occiput; pronotum and elytra aeneo-cupreous and ornated with numerous cinereous pubescent spots; beneath similar in color to above, but more shining, the sides of the abdominal segments ornated with dense cinereous pubescent spots.

Head feebly and evenly convex, without depressions, but with a short longitudinal carina on the occiput; front with the sides obliquely converging to the vertex; surface nearly glabrous, coarsely, deeply, and rather densely punctate, the punctures regularly separated and not confluent; intervals smooth; epistoma broadly and deeply arcuately emarginate at middle, the lateral angles of the emargination acutely rounded. Pronotum one and three-fifths times as wide as long, distinctly narrower in front than behind, widest at base; sides obliquely converging from base to anterior margin; posterior angles nearly rectangular; anterior margin nearly truncate, with an obsolete, broadly rounded, median lobe; base feebly bisinuate; disk with an obsolete median sulcus, a deep ante-scutellar fovea, and four densely punctured impressions, two at the base and two in front of the middle, forming a transverse quadrangle, the two basal ones more deeply, abruptly, and transversely impressed; surface coarsely, deeply, and rather densely punctate the punctures more remote on the post-median part, and the four impressions rather densely clothed with short, cinereous hairs. Scutellum rounded, subtruncate in front, and the surface obsoletely striolate. Elytra slightly wider than pronotum at base, obtusely rounded at humeral angles, nearly parallel to behind humeri, feebly sinuate at posterior coxae, then arcuately attenuate to the tips, which are truncate and feebly bidentate; surface striato-punctate, the stria feebly impressed, and becoming obsolete at the base and toward lateral margins, the stria punctures very small and obsolete, intervals flat, coarsely, densely, and irregularly punctate, the foveae smaller, more irregular, and less distinct than in *costulifera* and *multipunctata*, but the arrangement is similar and the foveae sparsely clothed with very short, cinereous hairs. Abdomen beneath coarsely, rather densely, and irregularly punctate, and sparsely clothed with short, cinereous recumbent hairs; first segment feebly flattened at middle; last segment broadly truncate and feebly sinuate at apex, with a narrow transverse depression behind the apical margin. Prosternum feebly convex; surface coarsely and rather densely punctate, and sparsely clothed with fine, long, erect, cinereous hairs; anterior mar-

gin broadly, abruptly declivous on each side of the middle; prosternal process flat, parallel to behind the anterior coxal cavities, then obliquely attenuate to the apex, which is acutely rounded.

Female.—Similar to the male, except that the head is aeneo-cupreous, and the prosternum and abdomen beneath not quite as densely pubescent.

Length, 13 mm.; width 4.5 mm.

This species was described by Castelnau and Gory (1838) from Port-au-Prince, Haiti, and seems to be confined to that island.

The following material has been examined. Coll. British Mus.: One specimen, labeled Haiti (Obert), compared with type, Kerremans, 1903-59, and two other specimens simply labeled St. Domingo. Coll. U. S. Nat. Mus.: Port-au-Prince, Haiti.

Genus BUPRESTIS Linnaeus

Buprestis LINNAEUS, Syst. Nat., 10 ed., 1758, pp. 408-410.—SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 279-281, pl. 10, fig. 10.—LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 40-42.—KERREMANS, Wytzman's Gen. Insectorum, fasc. 12, pt. 3, 1903, pp. 140-143.—CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, pp. 87-128.—NICOLAY and WEISS, Journ. N. Y. Ent. Soc., vol. 26, 1918, pp. 75-109, pls. 5-6.

Anolychira ESCHSCHOLTZ, Zool. Atlas, vol. 1, 1829, p. 9 (reprint p. 8).—CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis* pp. 125-149, pls. 30-31; addenda p. 3.

Anoplis KIRBY, Richardson's Fauna Bor. Amer., vol. 4, 1837, pp. 151-154.

Head flat or feebly convex, the sides nearly parallel; front not narrowed by the insertion of the antennae, and sometimes feebly grooved; epistoma short, and usually more or less emarginate in front; antennal cavities small, rounded, and situated a considerable distance from the inner margin of the eyes. Antennae rather long and slender, nearly as long as the head and pronotum united; first joint elongate, more or less clavate; third joint at least two times as long as the second; the following joints elongate, triangular, dentate on the inner side, and armed with a poriferous fovea situated on the inferior side at the apical margin of the joint. Eyes rather large, about two times as long as wide, moderately convex, and very feebly converging above. Pronotum wider than long; sides oblique, or more or less arcuate, with the lateral edges feebly and narrowly margined posteriorly; base bisinuate. Scutellum small and rounded. Elytra dilated behind the humeri, attenuate posteriorly, truncate or rounded at apex, which is more or less bidentate; disk striato-punctate, with the intervals flat or elevated, sometimes the alternate intervals costate. Sternal cavity formed by the mesosternum and metasternum; Mesosternum divided, the lateral branches elongate and feebly oblique; metasternum emarginate in front and grooved at the middle.

- | | |
|---|----------------------------|
| 6. Elytra with distinct spots or vittae..... | 7. |
| Elytra immaculate..... | 9. |
| 7. Elytron each with two reddish or fulvous vittae, more or less confluent and united..... | <i>lineata</i> Fabricius. |
| Elytron with fulvous spots or blotches..... | 8. |
| 8. Color above green to dark blue, the elytra ornated with irregular fulvous markings..... | <i>fasciata</i> Fabricius |
| Color above aeneous, with a brownish or purpureous tinge, the elytra ornated with irregular fulvous markings..... | <i>maculipennis</i> Gory. |
| 9. Elytral intervals between striae 2-3, 4-5, and 8-9 elevated and forming obtuse ridges..... | <i>maculativentris</i> Say |
| Elytral intervals flat..... | 10. |
| 10. Elytra fulvous, with the suture, lateral margins, and bottoms of striae purpureo-cupreous..... | <i>cubensis</i> Fisher. |
| Elytra piceous, with a strong purpureous or cupreous tinge. | <i>decipiens</i> Fisher. |

BUPRESTIS MACULIPENNIS Gory

Buprestis maculipennis GORY, Mon. Bupr., Suppl., vol. 4, 1840, pp. 118-120, pl. 21, fig. 117.—FLEUTIAUX and SALLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, 1890, p. 405 (separate p. 55).—NICOLAY and WEISS, Journ. N. Y. Ent. Soc., vol. 26, 1918, pp. 93-94, pl. 1, figs. 1-2.

Ancyllocheira maculipennis DEJEAN, Cat. Coleopt., 2 ed., 1833, p. 78; 3 ed., 1836, p. 88.

Buprestis inconstans MELSHEIMER, Proc. Acad. Nat. Sci., Phila., vol. 2, 1846, p. 146.

Buprestis deficiens CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, pp. 90-91.

Buprestis fusiformis CASEY, Proc. Wash. Acad. Nat. Sci., vol. 11, 1909, p. 91.

Buprestis scripta CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 91.

Buprestis reducta, CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 92.

Buprestis leporina CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 92.

Male.—Elongate oval, shorter and less attenuate posteriorly than *lineata*; head aeneous, front variable in color, sometimes yellowish or brick-red, with two central spots and a small spot at base of each antennae aeneous; pronotum and elytra aeneous, sometimes with a brownish or purpureous tinge, the former occasionally with the apical angles yellowish, the latter with yellowish markings, which are extremely variable, ranging from a few scattered spots to large confluent patches covering the entire elytra, except the humeri, suture, lateral margins, and a triangular spot in middle, extending from the lateral margins to suture and apex, but not forming vittae, as in *lineata*; beneath aeneous, the anterior part of prosternum, median part of sternum, and last abdominal segment more or less marked with yellow.

Head flat, with a feeble longitudinal carina on occiput; surface coarsely and irregularly punctate, and sparsely clothed with inconspicuous hairs; intervals smooth and rather shining; epistoma broadly, but feebly arcuately emarginate in front. Pronotum not

quite two times as wide as long, widest at base, distinctly narrower in front than behind; sides strongly, obliquely attenuate from base to apical angles; posterior angles acute and projecting; anterior margin nearly truncate at sides, with a broadly rounded median lobe; surface coarsely and rather densely punctate, the punctures deep and irregularly placed. Scutellum oval, somewhat truncate in front. Elytra a little wider than pronotum at base, slightly dilated behind the humeri, feebly sinuate at posterior coxae, then arcuately attenuate to the tips, which are truncate and rather strongly dentate; surface striato-punctate, the punctures fine, shallow, and distinctly separated; intervals nearly flat, with a few coarse, irregularly placed punctures. Abdomen beneath coarsely and rather densely punctate, the punctures variable in size and irregularly placed; intervals finely, densely granulose and sparsely clothed with fine semi-erect hairs; first segment broadly and deeply longitudinally grooved at middle; last segment broadly truncate at apex, with a small tooth on each side, the yellow spot at each anterior angle sometimes quite large and forming a fascia, but usually small and rarely missing. Prosternum flat, sparsely and coarsely punctate, and the anterior margin nearly truncate; prosternal process narrow, not or only obsoletely sulcate at middle, parallel to behind the anterior coxal cavities, then obliquely attenuate to the apex, which is acutely rounded. Anterior femora strongly swollen at middle; anterior tibiae emarginate, flattened on the inner side and armed with a large broad hook; anterior tarsi much broader than the posterior ones.

Female.—Similar to the male, but the head is a little more convex, yellow markings not as much extended, last ventral segment more rounded at apex, and the yellow markings more prominent, the anterior tarsi more slender and the anterior tibiae not armed with a hook at the apex.

Length, 10–14.5 mm.; width, 4.5–6 mm.

The name *maculipennis* was first used in this genus by Dejean (1833), without giving any description, but Gory (1840) described the species from a specimen in the Dejean collection from North America. This species is distributed over the eastern United States from Maine to Louisiana and westward to Missouri. It is closely related to *lineata*, but can be readily distinguished from that species by the yellowish elytral markings, more oval in form, and distinctly brassy tinge. The larvae is recorded as living in pine and hemlock.

It has been recorded by Fleutiaux and Sallé (1890) from Guadeloupe, but no specimens of this species have been examined from the West Indies.

BUPRESTIS APRICANS Herbst

Buprestis apricans HERBST, Nat. Syst. Ins. Käfer, vol. 9, 1801, pp. 125-126, pl. 145, fig. 9.—NICOLAY and WEISS, Journ. N. Y. Ent. Soc., vol. 26, 1918, p. 88.

Buprestis nigricornis STURM, Cat. Ins. Samml., 1826, p. 105.

Ancylotricha bosci CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, pp. 146-147, pl. 36, fig. 201.

Buprestis cribripennis CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 127.

Male.—Oblong oval, uniformly dull cupreous-brown, sometimes with a greenish or purplish tinge; beneath purpureous or aeneous, with a distinct cupreous tinge, and more shining than above.

Head feebly convex, with a more or less elevated median carina; surface very coarsely and densely punctate, the punctures confluent, and forming longitudinal rugae on the front, and rather densely clothed with long recumbent cinereous hairs; epistoma broadly, but feebly arcuately emarginate in front. Pronotum a little more than one and one-half times as wide as long; sides variable, in some specimens feebly, arcuately rounded and widest at middle, in others arcuately attenuate from base to apical angles and strongly sinuate at basal fourth; posterior angles nearly rectangular; anterior margin arcuately emarginate, with a broadly rounded median lobe; surface coarsely and rather densely punctate, the punctures irregularly placed and somewhat confluent at the sides and anterior margin. Scutellum round, and broadly depressed at middle. Elytra a little wider than pronotum at base, slightly dilated behind the humeri, strongly sinuate at posterior coxae, then arcuately attenuate to the tips, which are subtruncate, with a small tooth at the sutural angle; surface striato-punctate, the striae not impressed and the punctures near base at least two times as large as the punctures on intervals; intervals flat and coarsely, densely and irregularly punctate. Abdomen beneath coarsely and rather densely punctate, the punctures deep and irregularly placed, and sparsely clothed with long recumbent cinereous hairs; intervals smooth; first segment not grooved at middle; last segment broadly truncate and feebly sinuate at apex, and without lateral teeth. Prosternum rather flat, somewhat declivous in front, densely, coarsely punctate, and rather sparsely clothed with long recumbent hairs; anterior margin feebly sinuate; prosternal process feebly sulcate at the middle, parallel to behind the anterior coxal cavities, then feebly attenuate to the apex, which is very broadly rounded. Femora and tibia similar on all legs, the anterior tibiae without a hook at apex; anterior tarsi not distinctly broader than posterior ones.

Female.—There are but slight external structural differences in the sexes. The females are usually larger and broader, and the last abdominal segment more broadly rounded at apex.

Length, 16-24 mm.; width, 6-9 mm.

This species was described by Herbst (1801) from America. It is a southern species and its distribution extends along the Southern Atlantic and Gulf States, from North Carolina to Texas, and in some parts of the South the larvae becomes quite injurious to the long leaf pine (*Pinus palustris* Miller). The admission of the species in the present paper is based on a single specimen in the Coll. U. S. National Museum, labeled "Havana, Cuba (Roig)," and it is just possible that this specimen emerged from pine lumber shipped from the Southern States.

BUPRESTIS DECORA Fabricius

Buprestis decora FABRICIUS, Syst. Ent., 1775, p. 217.—OLIVIER, Entom., vol. 2, gen. 32, 1790, p. 18, pl. 8, fig. 82.—CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 578 (separates, p. 154).—FLEUTIAUX and SALLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, p. 405 (separates, p. 55).—GUNDLACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, 1891, p. 161, no. 1630.—NICOLAY and WEISS, Journ. N. Y. Ent. Soc., vol. 26, 1918, pp. 88-89.

Ancylotrira decora CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, pp. 145-146, pl. 36, fig. 199.—GUNDLACH, An. Soc. Espan. Hist. Nat., ser. 2, vol. 22, 1894, p. 623.

Male.—Narrow elongate; head and pronotum green, with the reliefs more or less violaceous or cupreous; elytra green, occasionally with distinct median indigo-blue vittae, and the suture and lateral margins always cupreous; beneath green, with a cupreous reflection.

Head feebly convex, with a distinct longitudinal carina on the occiput; surface very coarsely and densely punctate, the punctures confluent and forming longitudinal rugae on the front, and rather densely clothed with long erect cinereous hairs; epistoma broadly but feebly arcuately emarginate in front. Pronotum not quite two times as wide as long, widest at base, and slightly narrower in front than behind; sides feebly obliquely attenuate from base to apical angles; posterior angles acute and slightly projecting; anterior margin feebly arcuately emarginate, with a broadly rounded median lobe; disk sometimes with an obsolete median sulcus or smooth longitudinal area; surface deeply and densely punctate, the punctures very coarse, irregularly placed, and becoming somewhat confluent at the sides. Scutellum oval, somewhat truncate in front. Elytra a little wider than pronotum at base, slightly dilated behind the humeri, rather strongly sinuate at posterior coxae, then arcuately attenuate to the tips, which are rather broadly truncate and bidentate; surface feebly striato-punctate, the striae feebly impressed and becoming obsolete at sides and toward apex, the striae punctures very coarse, intermixed with smaller ones of the same size as those on the intervals; intervals flat and very densely punctate, the punctures coarse, deep, irregularly placed, and becoming confluent at sides and apex. Abdomen beneath coarsely and rather

densely punctate, the punctures variable in size and irregularly placed, rather densely clothed with long, erect, cinereous hairs; intervals obsoletely granulose; first segment not grooved at middle; last segment feebly sinuate at apex, with the lateral teeth obsolete or variable. Prosternum rather flat, rather densely clothed with long cinereous pubescence, and densely, coarsely punctate; anterior margin nearly truncate; prosternal process broadly sulcate at middle, parallel to behind the anterior coxal cavities, then obliquely attenuate to the apex, which is rather broadly rounded. Anterior femora strongly swollen at middle; anterior tibiae somewhat flattened at apex, but without a large hook; anterior tarsi much broader than the posterior ones.

Female.—Similar to the male, but differs from it by having the head and underside of body not as densely pubescent, last ventral segment of abdomen more broadly truncate at apex, and the anterior tarsi not distinctly broader than the posterior ones.

Length, 11–18 mm.; width, 4.5–6.5 mm.

Described by Fabricius (1775) from America. This species is found throughout the southeastern part of North America, and its distribution extends from New Jersey to Texas. The adults are very constant in coloration, size, and form, and are not rare in the Southern States; the larvae are found in pine.

Chevrolat (1867) records it from Guadeloupe in the collection of Chevrolat, and from Cuba in the collections of Gundlach and Poey. Fleutiaux and Sallé (1890) record it from Pointe à Pitre, Guadeloupe, around the wharfs (Vitrac), and Gundlach (1891) reports collecting it in the eastern part of Cuba, and also records it from Guadeloupe and North America. Gundlach (1894) also records it from Porto Rico.

The following material has been examined. Coll. Acad. Nat. Sci. Philad.: "Cuba" (Poey Coll. No. 13). Coll. S. C. Bruner: Labeled "Est. Cent. Agri. de Cuba, Feb. 27," without giving any definite locality. There is also a single example of this species labeled No. 1630 in the Gundlach Museum in Habana, which has not been examined.

BUPRESTIS STRIATA Fabricius

Buprestis striata FABRICIUS, Syst. Ent., 1775, p. 217.—OLIVIER, Entom., vol. 2, gen. 32, 1790, pp. 15–16, pl. 7, fig. 77.—NICOLAY and WEISS, Journ. N. Y. Ent. Soc., vol. 26, 1918, pp. 85–87.

Ancyllochira striata CASTELNAU and GOBY, Mon. Bupr., vol. 2, 1838, *Buprestis*, pp. 147–148, pl. 36, fig. 202.

Buprestis obscura CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 125.

Male.—Elongate oval, dark coppery-brown, sometimes with an obsolete aeneous reflection; beneath coppery-brown to bright cupreous and more shining than above.

Head feebly convex, with a distinct longitudinal carina; surface very coarsely and densely punctate, the punctures confluent and forming smooth longitudinal rugae on the front, and sparsely clothed with long erect cinereous hairs; epistoma broadly and rather deeply arcuately emarginate in front. Pronotum nearly two times as wide as long, widest at base, slightly narrower in front than behind; sides variable, feebly arcuately attenuate from base to apical angles, or nearly parallel to apical third, then strongly converging to the apex; posterior angles rather acute; anterior margin feebly arcuately emarginate, with a broadly rounded median lobe; disk obsoletely longitudinally sulcate at middle; surface coarsely and deeply punctate, the punctures irregularly placed, rather widely separated on the disk, but becoming denser and more confluent toward the sides. Scutellum rounded and impressed at middle. Elytra a little wider than pronotum at base, more or less dilated behind the humeri, nearly parallel to apical third, then arcuately attenuate to the tips, which are rounded, truncate, sinuate-truncate, or somewhat bidentate; each elytron with four costae, suture and lateral margin elevated, the costae smooth, rather flat, and sparsely, coarsely, and irregularly punctured, intervals densely and coarsely cribrate. Abdomen beneath rather finely and densely punctate at middle, the punctures becoming coarser and denser toward the sides and on apical segment, and sparsely clothed with long cinereous hairs; first segment feebly flattened at middle; last segment rounded, truncate or obsoletely sinuate at apex. Prosternum feebly convex, dentate, and very coarsely punctate, and sparsely clothed with long, erect cinereous hairs; anterior margin truncate; prosternal process flat, broadly sulcate at middle, smooth at sides, and densely punctured in the depression, parallel to behind anterior coxal cavities, then abruptly attenuate to the apex, which is broadly rounded. Anterior and middle femora feebly swollen at middle; anterior tibiae feebly flattened at apex, but without a long hook; anterior tarsi not distinctly broader than posterior ones.

Female.—Usually more robust and not quite as densely pubescent beneath as in the males.

Length, 13–20 mm.; width, 5.5–8 mm.

This is another North American species which was described by Fabricius (1775) from Pennsylvania. It is rather common and is distributed over the entire eastern North America from Canada to Texas and westward to Missouri, the larvae inhabiting various species of pine. Only one specimen was examined from the West Indies and this was received from the British Museum and simply labeled "Haiti, Saunders 74–18."

BUPRESTIS AURULENTA Linnaeus

Buprestis aurulenta LINNAEUS, Syst. Nat., 12 ed., 1767, p. 661.—OLIVIER, Entom., vol. 2, gen. 32, 1790, pp. 18-19, pl. 9, fig. 98.—FLEUTIAUX and SALLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, 1890, p. 405 (separates p. 55).—NICOLAY and WEISS, Journ. N. Y. Ent. Soc., vol. 26, 1918, pp. 82-84.

Ancyllochira radians LeCONTE, Proc. Acad. Nat. Sci. Phila., vol. 7, 1854, p. 17.

Ancyllochira lauta LeCONTE, Proc. Acad. Nat. Sci. Phila., vol. 7, 1854, p. 17.

Ancyllochira villosa LeCONTE, Proc. Acad. Nat. Sci. Phila., 1873, p. 331.

Buprestis fabulosa CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, pp. 119-120.

Buprestis aemula CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 121.

Buprestis tacomae CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 121.

Buprestis nupta CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, pp. 121-122.

Buprestis venusta CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 122.

Buprestis prospera CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 123.

Buprestis affinis CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 123.

Buprestis adulans CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 123.

Male.—Elongate-suboval, broader than *decora*; head and pronotum green, with the front of head and sides of pronotum more or less cupreous; elytra pale green to ultramarine, the suture and lateral margins usually bright cupreous; beneath bright green or cupreous.

Head feebly convex, with a distinct longitudinal carina; surface densely and coarsely punctate, the punctures confluent and forming longitudinal rugae on the front, and rather sparsely clothed with long recumbent cinereous hairs; epistoma broadly, but not deeply arcuately emarginate in front. Pronotum not quite two times as wide as long, widest near basal third, narrower in front than behind; sides arcuately rounded to middle, then more attenuate to the apical angles; posterior angles nearly rectangular; anterior margin feebly arcuately emarginate, with a broadly rounded median lobe; disk obsoletely longitudinally sulcate at middle; surface coarsely, rather densely, and deeply punctate, the punctures irregularly placed, and becoming denser and more confluent toward the sides, and with a few inconspicuous hairs; intervals obsoletely granulose. Scutellum oval, truncate at base and more or less depressed at middle. Elytra wider than pronotum at base, feebly dilated behind the humeri, sinuate at posterior coxae, then arcuately attenuate to the tips, which are more or less rounded or subtruncate, the sutural angle frequently minutely dentate; each elytron with four discal costae, a short post-scutellar costa, suture and lateral margin elevated, the summits of which are smooth and not punctate; intervals very densely and evenly cribrate. Abdomen beneath rather finely strongly, but not closely punctate, and rather densely clothed with long, fine cinereous hairs; intervals obsoletely granulose; first segment not sulcate at middle; last segment truncate at apex. Prosternum feebly convex, the anterior margin somewhat sinuate, and the surface coarsely,

densely punctate; prosternal process sulcate at middle, parallel to behind the anterior coxal cavities, then obliquely attenuate to the apex, which is obtusely rounded. Femora similar on all legs; anterior tibiae flattened at apex, but without a hook; anterior tarsi not distinctly broader than posterior ones.

Female.—The sexes show very few external structural differences, the females are usually larger, more robust and the abdomen beneath not quite as densely pubescent.

Length, 13–20 mm.; width, 5–7.5 mm.

Originally described by Linnaeus (1767) from North America. It is one of the most beautiful Buprestids and is very common along the Pacific coast, the distribution extending from British Columbia to southern California and eastward to the Rocky Mountains. It is a very variable species, both in color and size, and having caused considerable synonymy. The larvae live in Douglas fir, western red cedar, and various species of pines.

I have not seen any specimens from the West Indies, but Fleutiaux and Sallé (1890) report it from Guadeloupe. If their identification is correct, it was probably introduced in lumber from the Western States, as the species is not found in the eastern part of the United States.

BUPRESTIS LINEATA Fabricius

Buprestis lineata FABRICIUS, Syst. Ent., 1775, pp. 217–218.—OLIVIER, Entom., vol. 2, gen. 32, 1790, pp. 23–29, pl. 8, fig. 80.—CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, pp. 577–578 (separates pp. 153–154).—FLEUTIAUX and SALLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, p. 405 (separate p. 55).—GUNDLACH, Contribucion à la Entom. Cuba, vol. 3, pt. 5, 1891, pp. 160–161, no. 1416.—NICOLAY and WEISS, Journ. N. Y. Ent. Soc., vol. 26, 1918, pp. 94–95, pl. 1, figs. 3–4.—STAHL, Fauna de Puerto Rico, 1882, p. 171.

Ancylochira lineata CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, pp. 143–144, pl. 35, fig. 196.—GUNDLACH, Ann. Soc. Ent. Espan., Hist. Nat., ser. 2, vol. 22, 1894, p. 623.

Male.—Elongate oval; head aeneous, the front more or less fulvous, and usually enclosing two aeneous spots; pronotum aeneous, with the sides brick-red or fulvous; elytra piceous with a bluish or greenish tinge, and each elytron with two more or less connected brick-red or fulvous vittae, which, although rarely wanting, are never broken up into distinct spots; beneath aeneous, somewhat cupreous, the anterior part of prosternum and last ventral segment more or less marked with fulvous.

Head flat, with a feeble longitudinal carina on occiput; surface coarsely and irregularly punctate, and sparsely clothed with inconspicuous hairs; intervals smooth and subopaque; epistoma broadly arcuately emarginate in front. Pronotum about two times as wide

as long, widest at base, distinctly narrower in front than behind; sides strongly, obliquely attenuate from base to apical angles; posterior angles acute and projecting; anterior margin feebly emarginate, with a broadly rounded median lobe; surface coarsely and rather densely punctate, the punctures deep and irregularly placed. Scutellum oval, and somewhat truncate in front. Elytra as wide as pronotum at base, broadly dilated behind the humeri, feebly sinuate at posterior coxae, then arcuately attenuate to the tips, which are subtruncate and strongly dentate; surface striate-punctate, the punctures fine, shallow, and distinctly separated; intervals flat, with a few coarse, irregularly placed punctures. Abdomen beneath rather densely and deeply punctate, the punctures variable in size, irregularly placed, and somewhat confluent at sides and on last segment; intervals finely and densely granulose, and sparsely clothed with inconspicuous hairs; first segment broadly longitudinally grooved at middle; last segment broadly truncate and feebly sinuate at apex, with a small tooth on each side, the small fulvous spot at each anterior angle sometimes quite large and almost united into a fascia, but usually small and almost obsolete. Prosternum rather flat and coarsely and sparsely punctate; anterior margin broadly arcuately emarginate; prosternal process not sulcate at middle, parallel to behind anterior coxal cavities, then obliquely attenuate to the apex, which is rather acutely rounded. Anterior femora strongly swollen at middle; anterior tibiae emarginated, flattened on inner side, and armed with a large, broad hook at the apex; anterior tarsi much broader than posterior ones.

Female.—Similar to the male, but the head is a little more convex, last abdominal segment more rounded at apex, the anterior tarsi more slender, scarcely any wider than the posterior ones, and the anterior tibiae not armed with a hook at the apex.

Length, 12–20 mm.; width, 5–8 mm.

Described by Fabricius (1775) from America. It is distributed over the entire eastern part of North America, from Nova Scotia to Texas and westward to Indiana, the larvae living in various species of pine.

Chevrolat (1867) records it from Guadeloupe in the collection of Chevrolat, and from the central and eastern part of Cuba in the collection of Gundlach and Poey. Fleutiaux and Sallé (1890) record it from Guadeloupe, and Gundlach (1891) reports taking it at "Cienaga de Zapata" and Santiago de Cuba, and also records it from Guadeloupe. Gundlach (1894) and Stahl (1882) both record it from Porto Rico.

I have examined two specimens, one kindly loaned by the British Museum and labeled "Guadeloupe (Lhermanier) Coll. Chevrolat,"

and which is probably the specimen referred to by Chevrolat, Fleutiaux, and Sallé, the other in the collection of S. C. Bruner, labeled Camaguey, Cuba (J. Acuna).

The species is not represented in the Poey collection in Philadelphia, but there are two specimens labeled No. 1416 in the Gundlach Museum in Habana, which have not been examined.

BUPRESTIS FASCIATA Fabricius

Buprestis fasciata FABRICIUS, Mant. Ins., vol. 1, 1787, p. 177.—OLIVIER, Entom., vol. 2, gen. 32, 1790, p. 21, pl. 9, fig. 92.—FLEUTIAUX and SALLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, p. 405 (separates, p. 55).—NICOLAY and WEISS, Journ. N. Y. Ent. Soc., vol. 26, 1918, pp. 102-103.

Buprestis semmaculata HERBST, Nat. Syst. Ins., Käfer, vol. 9, 1801, pp. 163-164, pl. 148, fig. 5.

Ancylocheira (Buprestis) therminieri CHEVROLAT, Silbermann's Rev. Ent., vol. 5, 1838, pp. 68-69.—FLEUTIAUX and SALLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, 1890, p. 405 (separate, p. 55).

Ancylochira seaplata LECONTE, Trans. Amer. Philos. Soc. Phila., n. ser., vol. 11, 1859, pp. 205-206.

Buprestis fulgens CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, pp. 106-107.

Buprestis fortunata CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 107.

Buprestis saturata CASEY, Proc. Wash. Acad. Sci., vol. 11, 1909, p. 114.

Male.—Elongate oval, bright green to dark blue; elytra each with a conspicuous irregular pale fascia at apical third, a small oblique subapical spot, and with a large oblong or oval yellow discal spot behind the scutellum, but not quite attaining the base; beneath bright green, cupreous, or violaceous.

Head feebly convex, with an obsolete longitudinal carina on occiput; surface densely, coarsely, and confluent punctate and clothed with a few long inconspicuous hairs; epistoma rather deeply arcuately emarginate in front. Pronotum nearly two times as wide as long, widest near base, slightly narrower in front than behind; sides somewhat variable, evenly converging, and distinctly arcuate from a short and very feeble, although abrupt, basal swelling to the apex, and sometimes incurved at the base; posterior angles rather acute; anterior margin arcuately emarginate, with a broadly rounded median lobe; disk more or less impressed along the middle, and the ante-scutellar fovea distinct; surface deeply and rather densely punctate, the punctures coarse and irregularly placed. Scutellum small, subquadrate, truncate in front, but somewhat variable. Elytra slightly wider than pronotum at base, feebly expanded behind humeri, nearly parallel to apical third, then arcuately attenuate to the tips, which are more or less bidentate; surface strongly striate, the striae distinct, evenly, and rather closely punctate; intervals feebly convex, obsoletely, and remotely punctate. Abdomen beneath rather finely and densely punctate, the punctures becoming coarser and denser toward the sides; intervals

obsoletely granulose; first segment feebly impressed along middle; last segment broadly, arcuately emarginate at apex. Prosternum feebly convex, densely, coarsely punctate, and rather sparsely clothed with long, erect cinereous hairs; anterior margin nearly truncate; prosternal process feebly convex, not sulcate at middle, sides parallel to behind anterior coxal cavities, then obliquely attenuate to the apex, which is rather broadly rounded, anterior femora feebly swollen at middle; anterior tibiae somewhat flattened at apex, but without a large hook; anterior tarsi not broader than the posterior ones.

Female.—Usually more robust than the male, each elytron with an irregular yellow fascia at apical third, a small subapical spot, and occasionally with a small yellow discal spot at middle, prosternum sparsely punctured and not conspicuously pubescent, abdomen with the first segment more convex, and the last segment more sinuate at apex.

Length, 11–18 mm.; width, 4.5–7 mm.

This species was originally described by Fabricius (1787) from North America, and Chevrolat (1838) described the same species from Pointe à Pitre, Guadeloupe Island, under the name of *Iherminieri*. Fleutiaux and Sallé (1890) record both *fasciata* and *Iherminieri* from Guadeloupe.

The species although having a wide distribution, is usually not taken in numbers. It is found from Canada to Georgia, and westward to Wisconsin, and seems to be confined to the northeastern part of the country. The species varies considerably in elytral markings and coloration, which has caused much confusion and synonymy. No specimens have been examined from the West Indies and the above description was made from specimens from the United States.

BUPRESTIS MACULATIVENTRIS Say

Buprestis maculativentris SAY, Long's Second Expedition, vol. 2, 1824, p. 272–273.—NICOLAY and WEISS, Journ. N. Y. Ent. Soc., vol. 26; 1918, pp. 90–91:

Buprestis maculiventris GEMMINGER and HAROLD, Catal. Coleopt., vol. 5, 1869, p. 1378.

Ancylochira sernotata CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, pp. 129–130, pl. 32, fig. 178.

Ancylochira maura CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, p. 131, pl. 33, fig. 181 (Not *maura* Olivier).

Male.—Elongate, slightly oval; head aeneous or cupreous, and more or less marked with yellow on the front; pronotum and elytra aeneous, obscure viridis or subcupreous, the former with the apical angles yellow, shining; beneath aeneous to cupreous, sometimes with a purplish tinge, and the last four ventral segments of the abdomen

having on each side a reddish-yellow spot, those on the last segment being the largest and most irregular.

Head feebly convex with a distinct longitudinal carina, surface coarsely and rather densely punctate, and sparsely clothed with a few short inconspicuous hairs; epistoma broadly, but not very deeply arcuately emarginate in front. Pronotum nearly two times as wide as long, widest at base or basal fourth, narrower in front than behind; sides arcuately expanded at basal half, then obliquely attenuate to the apical angles; posterior angles rather obtuse; anterior margin feebly arcuately emarginate, with a broadly rounded median lobe; disk with large sublateral smooth spaces, and a distant smooth median line, which is finely striate at base; surface coarsely, but not densely punctate, the punctures irregularly placed and more confluent toward the sides. Scutellum rounded, transversely oval or subquadrate. Elytra slightly wider than pronotum at base, expanded behind the humeri, nearly parallel to apical third, then arcuately attenuate to the tips, which are rounded or truncate, and finely irregularly dentate, the outer angle obtuse, and never dentiform; surface feebly striato-punctate, the striae finely and rather closely punctured; intervals coarsely, sparsely and irregularly punctate, those between striae 2-3, 4-5, and 8-9 elevated, and forming obtuse ridges. Abdomen beneath coarsely and rather densely punctate, and sparsely clothed with short inconspicuous hairs, first segment broadly, longitudinally sulcate at middle; last segment sinuate, truncate or rounded at apex. Prosternum nearly flat, coarsely and irregularly punctate, and nearly glabrous; anterior margin feebly arcuately emarginate; prosternal process feebly convex, not sulcate at middle, gradually attenuate to the apex which is rather acutely rounded. Anterior femora strongly swollen at middle; anterior tibiae emarginate, flattened on inner side and armed with a large broad hook at the apex; anterior tarsi distinctly broader than the posterior ones.

Female.—Similar to the male, but the anterior tarsi not distinctly broader than the posterior ones, and the anterior tibiae not armed with a hook at the apex.

Length, 12-20 mm.; width, 4.5-7.5 mm.

Originally described by Say (1824) from the United States. This species seems to be confined to the northeastern part of North America and its distribution extends from Newfoundland to Pennsylvania and westward to Minnesota. The larvae live in various coniferous trees and the adults have been found emerging from pine timber, and have probably been introduced into Haiti in such produce. The following material of this species has been examined. Coll. British Mus.; two specimens labelled "Haiti, compared with type, *6-notata* Castelnau and Gory, Saunders, 74-18."

Castelnau and Gory (1838) give a description and figure of a species from Santo Domingo, which they supposed was the species described by Olivier as *Buprestis maura*. A translation of their description is as follows:

Length 9 lines, width $3\frac{1}{4}$ lines. Coppery bronze and very finely granulose. Head with several yellow spots. Sides of pronotum of the same color and with two small smooth spaces and a small impressed fovea behind. Elytra feebly obliquely truncate at tips, the surface striate and the intervals finely punctured. Abdomen with a yellow spot on each side and a transverse band on the last segment. Santo Domingo.

It is certainly not the same as the species described by Olivier, of which the following is a translation:

Size of *Buprestis austriaca*. Antennae black and serrate. Above entirely violet-black. Thorax with an impressed longitudinal groove. Scutellum small and rounded. Elytra striate and bidentate at apex. Found in South America.

The specimens from Haiti which were loaned by the British Museum are the same as the specimens of *maculativentris* Say from the United States, and also agree very well with the figure and description given by Castelnau and Gory for *maura*, but since this is not the species described by Olivier under that name I have placed *maura* Castelnau and Gory as a synonym of *maculativentris* Say. The true *Buprestis maura* described by Olivier is probably confined to South America.

BUPRESTIS CUBENSIS, new species

Male.—Form narrowly elongate; head piceous, with a strong purplish or bluish tinge, the entire front reddish-yellow, with two irregular central spots, and a small spot at base of each antennae cupreous or purplish black; pronotum and scutellum piceous, with a strong greenish or purplish tinge, the former with the anterior margin narrowly pale yellow, and the sides more broadly margined with reddish-yellow; elytra fulvous, becoming more reddish-yellow laterally, and with the suture, lateral margins and bottoms of striae purplish-cupreous; beneath brownish-cupreous, with the sternum, median parts of abdomen, and under side of femora more or less marked with a reddish-yellow color.

Head feebly convex, with a very narrow obsolete carina on occiput; surface irregularly, coarsely, but not deeply punctate, the punctures irregular in size and somewhat confluent on the occiput; intervals smooth and nearly glabrous; eyes feebly converging above, feebly convex, oval, and about two times as long as wide; epistoma broadly but not deeply arcuately emarginate in front. Pronotum nearly two times as wide as long, widest at basal fourth, distinctly narrower in front than behind; sides regularly arcuately expanded on basal half,

then obliquely attenuate to the apical angles; posterior angles nearly rectangular; anterior margin arcuately emarginate, with a broadly rounded median lobe; base rather strongly bisinuate; surface coarsely, deeply, and irregularly punctate, the punctures more widely and irregularly separated on the disk, but becoming more confluent toward the sides. Scutellum subquadrate, truncate in front, and rounded behind. Elytra slightly wider than pronotum at base, strongly expanded behind the humeri, feebly obliquely attenuate to apical third, then arcuately attenuate to the tips, which are transversely truncate, feebly sinuate and bidentate; surface striato-punctate, the striae not deeply impressed and the punctures fine and rather closely placed; intervals flat, not alternately elevated, and with a few shallow, coarse, and irregularly placed punctures. Abdomen beneath coarsely, sparsely, and irregularly punctate, and sparsely clothed with short recumbent cinereous hairs; intervals finely and densely granulose; first segment broadly obsolete sulcate at middle; last segment broadly truncate and feebly sinuate at apex. Prosternum feebly convex, shining, and very sparsely, coarsely punctate; anterior margin straight and narrowly declivous; prosternal process feebly convex, not sulcate at middle, parallel to behind the anterior coxal cavities, then obliquely attenuate to the apex, which is rather acutely rounded. Anterior femora slightly more swollen at middle than the middle or posterior ones; anterior tibiae emarginate, flattened on the inner side, and armed with a large broad hook at apex; anterior tarsi distinctly broader than posterior ones.

Female.—Unknown.

Length, 14.5 mm.; width, 5.5 mm.

Type locality.—Vinales, Cuba.

Type and paratype.—Amer. Mus. Nat. Hist.

Paratype.—Cat. No. 26813, U.S.N.M.

This species is described from three specimens received from the American Museum of Natural History, which were collected by C. W. Leng at the type locality between September 16 and 22, 1913, the vegetation consisting of scattered pines with a few oaks, etc.

BUPRESTIS DECIPIENS, new species

Female.—Form broadly elongate-oval; above uniformly piceous, with a strong purplish or cupreous tinge, head with a few small yellow spots on the front near epistoma, and the sides of the pronotum obsolete reddish-brown; beneath brownish-cupreous, with the sternal regions reddish-brown.

Head feebly convex, with a very narrow obsolete carina on the occiput; surface somewhat uneven, coarsely and rather deeply punctate, the punctures irregularly placed and confluent in some places;

intervals smooth and nearly glabrous; eyes feebly converging above, feebly convex, oblong, and about two times as long as wide; epistoma broadly but not deeply arcuately emarginate in front. Pronotum two times as wide as long, widest at basal fourth, distinctly narrower in front than behind; sides regularly arcuately expanded on basal half, then obliquely attenuate to apical angles; posterior angles nearly rectangular; anterior margin feebly arcuately emarginate, with a broadly rounded median lobe; base rather strongly bisinuate; disk with a broad obsolete longitudinal depression in front of scutellum, and a deep irregular one on each side near lateral margin; surface coarsely and deeply punctate, the punctures irregularly placed, more remotely separated on the disk and becoming more or less confluent in some areas. Scutellum subquadrate, truncate in front, and rounded behind. Elytra slightly wider than pronotum at base, rather strongly expanded behind the humeri, obliquely attenuate to apical third, then strongly arcuately attenuate to the tips, which are truncate, sinuate, and more or less bidentate; surface striato-punctate, the striae not deeply impressed, and the punctures fine and rather closely placed; intervals feebly convex, not alternately elevated, and with a few coarse irregularly placed punctures. Abdomen beneath coarsely, sparsely and irregularly punctate, and sparsely clothed with short recumbent cinereous hairs; intervals finely and densely granulose; first segment broadly flattened at middle; last segment rounded and more or less sinuate at apex. Prosternum feebly convex, shining, coarsely and very sparsely punctate; anterior margin feebly arcuately emarginate and narrowly declivous; prosternal process strongly convex, not sulcate at middle, parallel to behind the anterior coxal cavities, then obliquely attenuate to the apex, which is acutely rounded. Anterior femora slightly more swollen at middle than middle or posterior ones; anterior tibiae feebly flattened on inner side, but not armed with a broad hook at apex; anterior tarsi not distinctly broader than posterior ones.

Male.—Unknown.

Length, 19 mm.; width, 7.5 mm.

Type locality.—Vinales, Cuba.

Other localities.—Nueva Gerona, Isle of Pines.

Type.—Amer. Mus. Nat. Hist. *Paratype*.—Carnegie Museum.

Paratype.—Cat. No. 26814, U.S.N.M. (fragments).

This species is described from three specimens, one of which is in fragments. Two of these were received from the American Museum of Natural History and were collected at the type locality by C. W. Leng, between September 16 and 22, 1913, the vegetation consisting of scattered pines, with a few oaks, etc. The other specimen was received from the Carnegie Museum and was collected at Nueva Gerona, Isle of Pines, by G. Link, during March, 1913.

It is just possible that this may be the female of *cubensis* Fisher. Both of these species were collected in the same locality by Mr. Leng, and they resemble each other in a number of respects, but the coloration is entirely different. On account of these differences and without additional notes on their habits, it seems advisable to describe them as two distinct species, but should they prove to be sexes of the same species, it would show an extreme case of dichromatism, which would be unusual in this genus.

Genus MIXOCHLORUS Waterhouse

Mixochlorus WATERHOUSE, Trans. Ent. Soc. London, 1887, p. 177.—KERREMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 2, 1903, pp. 60-61.

Head feebly convex; epistoma wide, not narrowed by the antennal cavities and bisinuate in front; antennal cavities small, round, situated under a distinct carina at some distance from the eyes. Antennae 11-jointed, rather short and slender; first joint elongate, clavate and abruptly arcuate near base; second oblong, about two-thirds as long as third; third elongate, cylindrical and not quite as robust as the second; the following joints gradually becoming shorter toward the terminal joint, triangular (except the last joint, which is transversely oval), strongly serrate on the inner side, the serrate joints having the poriferous pores in a cavity on the lower anterior margin of the joints. Eyes large, broadly oval, strongly convex, and parallel on the inner margin. Pronotum a little wider than long, wider in front than behind, disk strongly convex, with three longitudinal impressions; base truncate or feebly bisinuate. Scutellum small, and touching the pronotum. Elytra elongate, truncate at base, and gradually acuminate posteriorly, punctato-striate, and longitudinally impressed at the suture. Sternal cavity formed by the mesosternum and metasternum, the lateral branches of the former elongate. Metasternum feebly emarginate in front. Prosternum truncate in front, and not grooved at middle. Posterior coxae scarcely dilated internally, the anterior margin sinuate and the posterior margin nearly straight. Legs rather robust; femora feebly swollen at middle; tibiae slender, and cylindrical; tarsi short, the first joint of the posterior pair about as long as the following two joints united; tarsal claws angularly dilated at base. Body agriliform.

This genus was erected by Waterhouse for a new species *Mixochlorus suturalis* from Honduras, and later he added *lateralis* from Mexico.²⁴ He states that it is clearly allied to *Agaeocera* and *Pelecopselaphus*. The genus was unknown to Kerremans and in ²⁵ he has placed it in the tribe Chalcophorini. If we follow the Kerremans

²⁴ Biol. Centr.-Amer. Coleopt., vol. 3, pt. 1, 1889, p. 168.

²⁵ Wytsman's Gen. Insectorum, fasc. 12, pt. 2, 1903, pp. 60-61.

classification, this genus should not be included in the tribe Chalcophorini as the antennal pores are placed on the lower anterior margin of the joints, but should be placed in the tribe Buprestini near the genus *Peronaemis* Waterhouse, to which it is closely allied.

MIXOCHLORUS ELEGANS, new species

Agriliform, broadly rounded in front and strongly acuminate behind, shining and nearly glabrous; head green, with a large triangular reddish-cupreous spot on the occiput, the spot divided longitudinally by a narrow green line; pronotum and elytra reddish-cupreous, the former with the lateral margins, sides of the anterior margin, and the median impressions aureo-viridis, the latter with the base, sutural and lateral margins aureo-viridis, the green area along the suture on each elytron rather wide from the base to basal third, then strongly constricted to behind the middle, where it is expanded into a wide triangular area, which extends internally to about the middle of the elytron; beneath viridis, with a feeble cupreous reflection; tibiae and tarsi aeneous.

Head feebly, evenly convex, nearly flat between the eyes, with a short longitudinal carina on occiput, and without any distinct impressions; surface glabrous, densely, and deeply punctate, the punctures large and becoming confluent on the front; intervals smooth on the front, becoming obsoletely granulose on the occiput; epistoma wide between the antennal cavities (about three times as wide as the cavities), rather deeply arcuately emarginate in front, and with an obtuse tooth on each side of the emargination. Pronotum strongly convex, slightly wider than long, slightly wider in front than behind, and widest near apical angles; sides feebly obliquely attenuate from near apical angles to the posterior angles, which are rather acute; anterior margin with a broadly rounded median lobe; base feebly bisinuate; surface with three longitudinal impressions, the median one broad and extending from the base to the front margin, more deeply impressed on the basal half, and a lateral one on each side about midway between the lateral margin and median depression, these impressions not as deeply impressed as the median one at base, and not reaching to the front margin; the surface is also regularly, densely, and coarsely punctate, the punctures deep, with well-defined sides, and distinctly separated, the intervals finely and densely granulose. Scutellum square and finely granulose. Elytra as wide as pronotum at base, widest just a little behind the humeral angles (when viewed laterally is strongly, arcuately expanded and declivous near humeral angles), nearly parallel and feebly sinuate to behind the middle, then arcuately attenuate to the tips, which are acute, with the lateral margins finely dentate near the apex; humeri

rather prominent; surface broadly, transversely impressed along base, and with an obsolete longitudinal impression along suture behind the triangular green area, irregularly punctato-striate, the punctures deep and coarse, and the striae somewhat confused; intervals densely punctate and finely rugose, the punctures irregularly placed, equal in size to those in the striae and somewhat confused, except on the disk. Abdomen beneath rather strongly convex, rather densely punctate, the punctures shallow, well separated, and becoming finer toward the apical segment, and from each puncture arises a short recumbent cinereous hair; intervals finely and densely granulose; last segment strongly attenuate, truncate at apex, with the preapical margin broadly, arcuately emarginate. Prosternum very coarsely punctate; anterior margin truncate and declivous; prosternal process nearly flat, with the apex rather broadly rounded.

Length, 8 mm.; width, 2.25 mm.

Type locality.—Sanchez, Dominican Republic.

Type.—American Museum of Natural History.

This beautiful insect is described from a single specimen loaned to me by the American Museum of Natural History, and collected by F. E. Watson along a creek at the foot of a mountain about three-fourths of a mile north of Sanchez, Dominican Republic, between May 28 and 31, 1915.

At first sight this insect might be mistaken for a species of *Agrilus* or *Engyaulus*, but can be distinguished from these genera by the characters given in the key. It is very closely allied to *Misochlorus suturalis*, described from Honduras by Waterhouse, but can be separated from that species by having the pronotum wider in front than behind, and the green sutural vitta irregular, expanded behind scutellum and middle of elytron, and not straight as in *suturalis*.

Genus PERONAEMIS Waterhouse

Peronaemis WATERHOUSE, Trans. Ent. Soc. London, 1887, p. 178.—KERREMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 3, 1903, pp. 145-146.

Head feebly convex; epistoma wide, not narrowed by the antennal cavities and nearly truncate in front; antennal cavities rather large, triangular, rounded behind and prolonged into a groove in front, situated under an obsolete carina at some distance from the eyes. Antennae 11-jointed, rather short and slender; first joint elongate, clavate and abruptly arcuate near base; second oblong, about two-thirds as long as the third; third elongate, cylindrical, feebly clavate at apex, and not quite as robust as the second, the following joints gradually becoming shorter toward the apical joint, triangular (except the last joint, which is nearly round), strongly serrate on the inner side, the serrate joints having the poriferous pores in a cavity on the lower anterior margin of the joints. Eyes large, oviform,

strongly convex, and nearly parallel on the inner margin. Pronotum a little wider than long, narrower in front than behind, strongly convex anteriorly, with three deep ovate impressions at the base; lateral margins not visible anteriorly from above. Scutellum transverse and trapezoidal. Elytra elongate, sinuate at base and strongly acuminate toward the apex. Sternal cavity formed by the mesosternum and metasternum, the lateral branches of the former elongate. Metasternum truncate in front. Prosternum truncate in front and not grooved at middle. First and second segments of abdomen distinctly separated by a suture. Posterior coxae feebly dilated internally, the anterior and posterior margins arcuately emarginate. Legs rather robust; femora feebly swollen at middle; tibiae slender, cylindrical and straight; tarsi short, the first joint of posterior pair scarcely as long as the second and third united; tarsal claws broadly angularly dilated at base. Body agriliform.

This is a monobasic genus and was erected for *thoracicus* Waterhouse.

It is closely allied to *Mixochlorus* but differs from it in having the pronotum narrower in front than behind, more strongly convex anteriorly, and the three basal impressions deeper and only reaching to the middle; scutellum transverse and the elytral intervals more costiform.

PERONAEMIS THORACICUS Waterhouse

Peronaemis thoracicus WATERHOUSE, Trans. Ent. Soc. London, 1887, pp. 178-179, figure.

Broadly agriliform, broadly rounded in front and strongly acuminate behind, narrower behind than in front, shining and glabrous; head green, the entire median part reddish-cupreous; pronotum reddish-cupreous, with the base brownish-aeneous and the lateral impressions partially greenish; scutellum green; elytra aeneous and ornated with irregular brownish areas; elytral epipleura bluish-green; beneath bluish-green, with aeneous and purplish reflections, and the sides of prosternum reddish-cupreous.

Head feebly and evenly convex, nearly flat between the eyes and with a short, obsolete, longitudinal carina on the occiput, and without any distinct impressions; surface densely and deeply punctate, the punctures coarse, irregularly placed, and becoming somewhat confluent at the sides; intervals finely and densely granulose; epistoma wide between the antennal cavities (about four times as wide as the cavities), feebly, broadly arcuately emarginate in front with the sides strongly angulated. Pronotum strongly convex anteriorly, one and one-third times as wide as long, slightly wider at base than at apex, and widest at base; sides broadly, arcuately rounded from apical angles to basal fourth, then obliquely expanded to the posterior

angles, which are slightly diverging and acute; anterior margin with a broadly rounded median lobe; base nearly truncate to middle of elytron, with a broadly rounded median lobe; when viewed laterally the lateral margin runs obliquely downward and disappears anteriorly; surface with three large basal impressions extending to the middle, the median one is rather broader than the others, densely and coarsely punctate, the punctures deep, rather irregularly placed and becoming more widely separated in the impressions; intervals nearly smooth except in the impressions where they are densely, finely granulose. Scutellum about two times as wide as long; sides obliquely narrowed anteriorly; posterior margin broadly rounded; surface finely and densely granulose. Elytra slightly wider than pronotum at base; sides strongly angulated a little behind the humeral angles, nearly parallel to apical third, where they are broadly rounded, then strongly acuminate to the tips, which are acute, with a tooth at the apex of each elytron, and the lateral margins finely and irregularly denticulate; humeral angles nearly rectangular, surface broadly impressed at base, there is a quadrangular spot occupying the scutellar region, and a second square spot along lateral margin at middle of the elytron, but not extending to the suture, of a brownish color, more shining, and slightly more elevated than the rest of the elytra, the humeral callosity and the margin near the base are also of the same brownish color, the surface is also punctate-striate, the punctures coarse at the base but becoming finer toward the apex; intervals slightly costiform, with a few coarse, irregularly placed punctures, and becoming densely granulose and somewhat rugose posteriorly. Abdomen beneath strongly convex, rather densely punctate, the punctures large, well separated, and becoming finer toward the apex, and from each puncture arises a rather long, recumbent hair; intervals finely and densely granulose; last segment strongly attenuate, and rather deeply arcuately emarginate at apex. Prosternum very coarsely punctate, the punctures deep and well separated; anterior margin truncate and declivous; prosternal process nearly flat, sides parallel to behind coxae, then obliquely attenuate to the apex, which is broadly rounded. Posterior coxae with the surface strongly concave, sparsely punctate, the punctures very coarse internally but becoming finer in the concavities.

Length, 10.5 mm.; width, 3.5 mm.

This species was described from Jamaica by Waterhouse.

Through the kindness of the British Museum I have been able to examine a single specimen from their collection labeled "Jamaica" and from which the above description was made. Superficially this species resembles specimens of the genus *Agrius*, but the lateral branches of the mesosternum are distinct and the species is remarkable in having three deep basal depressions on the pronotum.

Genus *AGLAOSTOLA* Thomson

Aglaostola SAUNDERS, Catal. Bupr., 1871, p. 47.—LAFERTÉ MSS.—THOMSON, Typ. Bupr., 1878, p. 42.—KERREMANS, Wytzman's Gen. Insectorum, fasc. 12, pt. 3, 1903, pp. 155-156.

Head flat, front rugose; epistoma narrowly and deeply emarginate in front, the emargination forming a semicircle, and the sides produced into an acute lobe, not narrowed by the antennal cavities, which are large, somewhat triangular, and situated under a distinct carina at some distance from the inner margin of the eyes. Antennae 11-jointed, rather long and slender; first joint clavate, elongate and abruptly arcuate near base; second obconic, about one-half as long as the third; third elongate, slightly flattened, and about three-fourths as long as the first; fourth and fifth elongate, about equal in length to the third and feebly enlarged at apex; the following joints gradually becoming shorter toward the terminal joint, triangular, strongly enlarged at apex (except the last joint, which is oval), and strongly dentate on the inner side; joints four to eleven armed with a large subterminal poriferous fovea. Eyes elliptical, oblique, and nearer to each other on the vertex than at the front. Pronotum wider than long, trapeziform, disk moderately convex; sides obliquely narrowed anteriorly; anterior margin sinuate, with a median lobe; base nearly truncate. Scutellum subpentagonal, a little wider than long, and attenuate posteriorly. Elytra elongate, truncate at base, without distinct basal depressions and entirely covering the pygidium; sides nearly parallel in front, then strongly acuminate to the tips, which are strongly bidentate, the lateral margins unarmed. Sternal cavity formed by the mesosternum and metasternum, the lateral branches of the former elongate and curved. Metasternum lobed in front. Prosternum with the anterior margin truncate at middle, and strongly lobed on each side; prosternal process wide, arcuately emarginate between the anterior coxae, and acuminate at apex. Posterior coxae distinctly dilated internally; anterior margin straight; posterior margin oblique. Legs rather robust; anterior and middle femora strongly swollen at middle; tibiae slender and cylindrical; tarsi rather long; first joint of posterior pair about as long as the following two joints united; sides of third joint prolonged beyond the fourth; tarsal claws with a feeble tooth at base.

This is a monobasic genus, and the name was first used by Saunders (1871) for *tereticollis* Pallas without giving any description. Thomson (1878) described the genus and uses the same name.

AGLAOSTOLA TERETICOLLIS (Pallas)

Buprestis tereticollis PALLAS, Icon. Ins., 1782, pp. 75-76, pl. D, fig. 18.

Buprestis corusca FABRICIUS, Mant. Ins., vol. 1, 1787, p. 176.

Female.—Elongate, navicular, attenuate in front, more acuminate posteriorly, and narrower behind than in front, glabrous, shining, golden-green above, with a bluish reflection in certain lights, and each elytron ornated with an irregular cupreous spot along lateral margin near apex; beneath golden-green, with a bluish reflection, and the abdomen cupreous, especially toward the sides.

Head feebly convex, front flat, triangular, about three-fifths as wide at vertex as at base, with a narrow longitudinal groove on the occiput, and a broad transverse impression behind the epistoma; surface glabrous, with numerous large, deep, irregularly placed punctures, and the intervals more finely, obsoletely and irregularly punctate. Pronotum regularly convex, with a round deep fovea in front of scutellum, a triangular one on each side along base at middle of elytron; and a narrow transverse groove on each side along the anterior margin, the groove not extending to the middle, one and one-half times as wide as long, distinctly narrower in front than behind, widest at base; sides obliquely attenuate from base to anterior margin; anterior margin with the median lobe rather obsolete, but broadly rounded; posterior angles nearly rectangular; surface with numerous large, deep, irregularly placed punctures, the intervals finely, obsoletely, and rather densely punctate. Scutellum smooth. Elytra wider than pronotum at base, widest just behind humeral angles, which are broadly rounded; sides broadly rounded behind humeral angles and nearly parallel to just behind the middle, then arcuately attenuate to the tips, which are feebly expanded, strongly emarginate and produced into two strong teeth, one at the suture and the other at the lateral margin, the teeth about equal in length; surface nearly smooth, with a few obsolete costae at apex, sparsely punctate, the punctures rather large, irregularly placed and tending to form longitudinal rows in some places, the intervals very finely irregularly punctate, and obsoletely rugose. Abdomen beneath strongly convex, sparsely punctate, the punctures rather large, irregularly placed, and from each arises an obsolete, erect hair; intervals finely and densely granulose; first segment broadly but not deeply grooved for its entire length; last segment deeply arcuately emarginate at apex. Prosternum convex without a median groove; apex rather acute; surface with numerous large and very fine punctures intermixed.

Length, 19-22 mm.; width, 6.5-7 mm.

Male.—Similar to the female but differ from it in being smaller and having the last abdominal segment nearly truncate at apex, with the preapical margin feebly, arcuately emarginate.

Length, 13 mm.; width, 4.25 mm.

Pallas (1782) in his original description gives Brazil as the type locality for this species which is probably an error. Fabricius (1787) described the same species from Jamaica under the name *corusca*. This species, as far as known, is confined to Jamaica, and specimens have been examined from the following collections: Coll. W. J. Holland: Three specimens, from Jamaica (F. Klages). Coll. British Mus.: One specimen, labeled "Parry, compared with type *corusca* Fabr. Coll. Banks, Saunders 74-18"; another labeled "Jamaica (Tarnier)," determined by Kerremans as *tereticollis* Pallas; and a third specimen simply labeled "Jamaica." Coll. U. S. Nat. Mus.: One specimen, Jamaica (F. Klages) (donated by Dr. W. J. Holland).

Genus ANTHAXIA Eschscholtz

Anthaxia ESCHSCHOLTZ, Zool. Atlas, vol. 1, 1829, p. 9 (reprint, p. 8).—

SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 297-298, pl. 12, fig. 22.—CASTELNAU and GOBY, Mon. Bupr., vol. 2, 1839, pp. 1-2, pl. 1.—

LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 49-50.—KERREMANS, Wytzman's Gen. Insectorum, fasc. 12, pt. 3, 1903, pp. 170-177.

Cratomerus SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 295-296, pl. 12, fig. 21.—CASTELNAU and GOBY, Mon. Bupr., vol. 2, 1839, p. 1, pl. 1.

Head vertical, front flat or concave, sometimes impressed along epistoma and not narrowed by the insertion of the antennae; epistoma short, wide, and sinuate or emarginate in front; antennal cavities small, round, not concealed by a carina, and situated nearer the epistoma than the eyes. Maxillary palpi three jointed; first joint elongate and enlarged at apex; second short, obconical; the third cylindrical or suboval. Antennae 11-jointed, short and slender, except the males of some *Cratomerus*, which have it rather robust; first joint elongate and clavate; second and third short, obconical, the third usually longer than second; the following joints triangular, dentate on the inner side, and with terminal poriferous pores. Eyes large, oval, subparallel or feebly converging on the vertex, and sinuate on inner margin. Pronotum transverse, quadrangular, rarely as long as wide; sides arcuately rounded; anterior margin bisinuate or emarginate, with a more or less distinct median lobe; base truncate or obsoletely rounded. Scutellum small, triangular, or ogival. Elytra truncate at base, apex rounded, and the lateral margin dentate or unarmed. Mesosternum divided. Metasternum truncate in front and with a groove at the middle, the epimera visible at the side. Posterior coxae moderately dilated internally, the anterior side sinuate or horizontal, the posterior side oblique and a little arcuate. Legs more or less robust, often slender; femora fusiform, rather thick, the posterior pair sometimes swollen and arcuate; tibiae slender and cylindrical; tarsi with first joint elongate, second shorter, third and

fourth enlarged and cordiform. Body oval, rarely elongate, and feebly convex above.

The genus *Cratomerus* was erected by Solier for the species having the antennae robust and the intermediate joints enlarged, and the posterior femora swollen and arcuate in the males, but these characters are not only variable in the species, but also vary among individuals of the same species.

This genus has a very wide distribution, the species being found in all parts of the world, with the exception of Australia. The species are quite variable in color, difficult to separate and have caused considerable synonymy. Previously only one species has been recorded from the West Indies.

ANTHAXIA BIFOVEATA, new species

Form oblong, strongly depressed, broadly rounded in front and more attenuate behind; head violaceous; pronotum and scutellum piceous, with a strong bluish tinge; elytra bluish-green; beneath cyaneous, with the prosternum and middle of abdomen more greenish.

Head feebly convex, with the front rectangular and the sides feebly sinuate and parallel; front broadly and rather deeply depressed; surface glabrous, coarsely and rather densely punctate, the punctures very shallow, irregularly placed, and coarsely and densely granulose; eyes large, moderately convex, and parallel; epistoma narrow, feebly triangularly, but not deeply emarginate in front; antennae short, the serrate joints wider than long. Pronotum strongly transverse, one and three-fifths times as wide as long, widest at middle, slightly narrower in front than behind; sides regularly and rather broadly rounded to near posterior angles, where they are slightly sinuate; posterior angles acutely angulated; anterior margin deeply arcuately emarginate, with an obsoletely rounded median lobe; base obsoletely rounded; disk moderately convex, with a large, very deep impression on each side at the posterior angles, each impression covering about one-third of the basal region, extending to the base and lateral margins, and connected to each other at the basal third by a transverse shallow, broadly concave impression; surface coarsely, densely granulose, and obsoletely reticulate, the reticulation irregular and somewhat oval on the median parts, but becoming longitudinally strigose at the sides. Scutellum ogival, surface densely, coarsely granulose. Elytra as wide as pronotum at middle; sides obtusely angulated at humeral angles, nearly parallel to apical fourth, then strongly arcuately attenuate to the tips, which are separately narrowly rounded; lateral margins obsoletely serrate posteriorly; humeri prominent; base truncate; disk with a rather broad basal impression, deeper at the humeri and becoming more

obsolete toward the scutellum, there is also a narrow impression along the lateral margin extending from the humeral angles to apex, and a similar one along the suture near apex, causing the suture to be slightly elevated posteriorly; surface densely and coarsely granulose, becoming somewhat rugose in basal region, and with irregular rows of coarse, irregularly placed punctures, which are somewhat obsolete posteriorly, but becoming coarser and very deep at apex. Abdomen beneath coarsely and rather densely reticulate, and glabrous; last segment acutely rounded at apex, strongly declivous, and the surface broadly and deeply concave. Prosternum strongly convex, broadly arcuately emarginate in front, with the surface strongly reticulate and densely granulose; prosternal process flat, sides parallel and only feebly expanded behind the anterior coxal cavities; apex truncate, with an obtuse tooth at the middle. Tarsal claws simple.

Length, 5.25 mm.; width, 2 mm.

Type locality.—Cuba.

Type.—Amer. Mus. Nat. Hist.

This species is described from a single specimen, collected by Jos. H. Pazos in Cuba, without giving any definite locality, and which was loaned for study by the American Museum of Natural History. This specimen has the right elytron discolored.

At first this was identified as *subsiniuata* Gory, but after carefully reading the redescription from the type given by Chevrolat it was found to differ from it in a number of details. It does not exactly agree with the description given by Gory, which is very short and incomplete, and his figure shows a more elongate species, more attenuate posteriorly, and the pronotum much narrower in front than behind. Chevrolat gives the color as plumbeus-black, and places it near *A. viridicornis* Say and *cyanella* Castelnau and Gory from the United States, but *bifoveata* is very distinct from any North American species by having the pronotum broadly and very deeply impressed at the posterior angles.

ANTHAXIA SUBSINUATA Gory

Anthaxia subsiniuata, DEJEAN, Cat. Coloept., 3 ed., 1836, p. 91 (no description).—GORY, Mon. Bupr. Suppl., vol. 4, 1841, pp. 289-290, pl. 48, fig. 283.—JACQUELIN DUVAL, in Ramon de la Sagra's Hist. Phys. Polit. et Nat. de l'île de Cuba, Anim. Artic., 1857 (French Edition), p. 65; (Spanish Edition) vol. 7, 1857, p. 29.—CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 581 (separates p. 157).—GUNDLACH, Contribucion à la Entom. Cuba, vol. 3, pt. 5, pp. 164-165.

The following is a translation of Gory's original description:

Greenish-black; thorax bi-impressed and punctate; elytra granulose. Length, $2\frac{1}{2}$ lines; width, $\frac{3}{4}$ line. Habitat, Cuba.

Greenish-black. Mandibles of a beautiful golden-green. Head punctate, with purplish reflection. Thorax with the anterior angles declivous, the posterior ones straight, and the surface covered with round, rather closely placed punctures, and near the posterior angles with a rather large impression, which is smooth at the bottom. Scutellum cupreous, triangular, and very finely granulose. Elytra granulose, impressed at the base, and rounded at the apex, and with the lateral margins and suture elevated behind the middle. Beneath the body and legs are punctate, and of a very dark wine color.

No specimens of this species have been examined. Jacquelin Duval (1859) and Gundlach (1891) report it from Cuba, but both authors state that they have not seen any specimens of it. From the records it seems that the only known specimen of this species is the type in the collection of Count Mnischev. Chevrolat (1867) has examined the type, from which he gives a redescription, and the following is a translation of it:

Blackish-plumbeous, opaque, beneath shining; head flat, the front with a rather deep and short fovea; eyes green. Thorax transverse; front bisinuate, with a rounded median lobe; base nearly straight; sides toward middle transversely impressed; elytra granulose, each elytron with four foveae in front and middle, apex obtusely rounded. Length, 5.5 mm.; width, 2 mm. Habitat, Cuba.

Genus MELANOPHILA Eschscholtz

Melanophila ESCHSCHOLTZ, Zool. Atlas, vol. 1, 1829, p. 8 (reprint, p. 8).—

LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 47-49.—HORN, Trans. Amer. Ent. Soc., vol. 10, 1882, pp. 101-106, pl. 4.—KERREMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 3, 1903, pp. 163-166.

Apatura CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, pp. 1-10, pls. 1-2, Addenda p. 2.

Dtana CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, *Buprestis*, pp. 155-157, pl. 38-39.

Trachypteris KIRBY, Richardson's Fauna Bor. Amer., vol. 4, 1837, pp. 158-160.

Oxypterus KIRBY, Richardson's Fauna Bor. Amer., vol. 4, 1837, pp. 160-161.

Head nearly flat and not narrowed by the insertion of the antennae; epistoma very short and narrow, broadly arcuately emarginate in front; antennal cavities small, round, not concealed under a carina, narrowly closed in front and situated a short distance from the inner margin of the eyes. Antennae moderately long, subfiliform; first joint clavate and somewhat elongate; second short, obconic; third slightly longer than the second, and shorter than first, feebly triangular; the following joints triangular, dentate on the inner side, and armed with a terminal poriferous fovea. Eyes elliptical, elongate, feebly oblique, and only a little closer to each other on the vertex than at the front. Pronotum wider than long; disk feebly convex, sometimes grooved at the middle or impressed on the sides; sides angulate or arcuately rounded, with a smooth marginal carina; base

distinctly bisinuate. Scutellum small, rounded or transverse. Elytra moderately elongate, subdepressed strongly acuminate posteriorly and entirely covering the pygidium; lateral margins dentate; apex rounded or armed with strong teeth. Sternal cavity formed by the mesosternum and metasternum, the lateral branches of the former rather elongate. Mestasternum truncate or feebly lobed in front. Prosternum with the anterior margin truncate, and not lobed; prosternal process narrow, expanded behind the coxal cavities, and acuminate at apex. Posterior coxae feebly dilated internally; anterior margin strongly bisinuate; posterior margin nearly straight. Legs feebly robust; anterior femora more robust than posterior ones; tibiae normal, slender and cylindrical; tarsi elongate, and slender. Body oblong and rather strongly depressed.

This genus contains a large number of species and has a wide distribution, but the species are more numerous in North and South America, and Europe.

The species are variable in form and color and their number have been greatly exaggerated by the great variation in the color and elytral markings, and also on account of a few species having a distribution which covers the entire circumpolar region, these conditions have caused much confusion and synonymy. So far, only two species have been reported from the West Indies, both of which are found in the United States, and may have been introduced into the islands in lumber.

KEY TO THE SPECIES

1. Front of head sparsely, irregularly punctate, and strongly shining; elytra usually with yellow markings, sometimes entirely black.

notata (Castelnau and Gory).

- Front of head densely, coarsely punctate, and opaque; elytra always uniformly black..... acuminata (De Geer).

MELANOPHILA NOTATA (Castelnau and Gory)

Apatura notata CASTELNAU and GORY, Mon. Bupr., vol. 2, 1838, p. 4, pl. 1, fig. 5; addenda p. 2.

Melanophila notata CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 580 (separates p. 156).—GUNDLACH, Contribucion á la Entom. Cuba, vol. 3, pt. 5, 1891, pp. 163–164, no. 1705.

Melanophila luteosignata MANNERHEIM, Bull. Soc. Imp. Nat. Moscou, vol. 10, No. 8, 1837, p. 70.

Phaenops luteosignata ZIEGLER, Proc. Acad. Nat. Sci. Phila., vol. 2, 1845, p. 267.—DEJEAN, Cat. Coleopt., 3 ed., 1836, p. 89.

Melanophila opaca LECONTE, Trans. Amer. Philos. Soc., n. ser., vol. 11, 1857, p. 213.

Form broadly elongate and strongly depressed, broadly rounded in front and strongly acuminate behind; head and pronotum black,

the former strongly shining; elytra black, with variable orange-yellow markings, which are sometimes entirely wanting; beneath black, with a strong purplish reflection and very sparsely pubescent.

Head feebly convex, with the sides feebly obliquely narrowed to the vertex; front and vertex without distinct depressions or carinae; surface coarsely and rather sparsely punctate, the punctures oblong and irregularly placed; intervals smooth and shining; epistoma broadly arcuately emarginate in front, forming an obtuse tooth on each side of the emargination. Pronotum transverse, one and one-half times as wide as long, widest just in front of middle, narrower behind than in front; sides arcuately rounded in front, more obliquely attenuate posteriorly to the posterior angles, which are rectangular, the marginal line distinct posteriorly; anterior margin deeply arcuately emarginate, with a broadly rounded median lobe; base bisinuate, with a large broadly rounded median lobe, which is feebly elevated near the scutellum; disk with an obsolete longitudinal median line terminating in a round deep fovea in front of scutellum, strongly depressed at base near posterior angles, and sometimes with a broad obsolete depression on each side of the median line; surface coarsely and obsoletely punctate at middle, the sides of punctures forming crenulate lines, which are somewhat concentric, toward the sides the punctures are larger, deeper and more confluent, the sides forming a network of irregular polygonal areas, with the bottoms densely granulose. Scutellum small, cordate, with the surface depressed and granulose. Elytra wider than pronotum at base; sides obtusely angulate at base, broadly rounded at humeri, feebly sinuate and nearly parallel to apical third, then strongly arcuately attenuate to the tips, which are acute; lateral margins finely serrate posteriorly; humeri not prominent; surface strongly broadly depressed at base near humeral angles, and densely, coarsely scabrous. Abdomen beneath with posterior margin of segments smooth, and the surface coarsely and rather deeply punctate, the punctures deeper, open posteriorly, and somewhat confluent on the basal segments, becoming more obsolete and forming crenulate lines toward the apex; last segment feebly arcuately emarginate at apex, the angles not prominent, and with a distinct serrate subapical ridge. Metasternum densely and coarsely punctate, with the sides well defined. Prosternum strongly convex, anterior margin truncate, declivous and without a median lobe, the surface rather finely and densely punctate; prosternal process feebly convex, sides narrowly margined, surface densely and coarsely punctate, abruptly expanded behind the coxal cavities, and with an acute tooth at the apex. First joint of posterior tarsi as long as the following two joints united.

Length, 7-15 mm.; width, 2.5-5.5 mm.

This species varies considerably in size and in the arrangement of the colored markings on the elytra. There will be no difficulty in separating the maculate forms from *acuminata* De Geer, and the specimens which have the elytra entirely black can be separated from it by the head being more sparsely, irregularly punctate, and very strongly shining. There does not seem to be any good external characters for separating the sexes, either in this species or in *acuminata*.

It was described by Castelnau and Gory from North America without giving any definite locality. LeConte (1859) described the black form from Georgia, under the name of *opaca*. It is widely distributed and its range extends from the Middle States into Mexico. Chevrolat (1867) records it from the Isla de Pinos in the collections of Gundlach and Poey. Gundlach (1891) reports it from the same locality. Specimens have been seen from the following West Indian localities: Coll. U. S. Nat. Mus.; Bahamas, collected on vessel by (H. F. Wickham). Coll. Amer. Mus. Nat. Hist.: "Bahamas" without definite locality; black form, Nassau, Bahamas, May-June, 1904 (W. M. Wheeler). No specimens were found in the Poey collection in Philadelphia, but there is a single example labeled No. 1705 in the Gundlach Museum in Habana which has not been examined by the writer.

MELANOPHILA ACUMINATA (De Geer)

- Buprestis acuminata* DE GEER, Mem. Hist. Ins., vol. 4, 1774, pp. 133-134.
Buprestis acuta GMELIN, Linn. Syst. Nat., 13 ed., vol. 1, pt. 4, 1788, p. 1839.
Buprestis morio FABRICIUS, Ent. Syst., vol. 1, pt. 2, 1792, pp. 210-211.—
 PAYKULL, Faun. Suec. Ins., vol. 2, 1799, p. 280.
Buprestis appendiculata FABRICIUS, Ent. Syst., vol. 1, pt. 2, 1792, p. 210.—
 ESCHSCHOLTZ, Zool. Atlas, vol. 1, 1829, p. 9.
Phaenops appendiculata DEJEAN, Cat. Coleop., 3 ed., 1836, p. 89.
Apatura appendiculata CASTELNAU and GORY, vol. 2, 1838, pp. 8-9, pl. 2,
 fig. 14; addenda, pp. 2 and 3.
Anthaxia pecchiolii CASTELNAU and GORY, Mon. Bupr., vol. 2, 1839, pp.
 33-34, pl. 8, fig. 46.
Buprestis atropurpureus SAY, Journ. Acad. Nat. Sci. Phila., vol. 3, 1823,
 p. 160.
Oxypterus appendiculata KIRBY, Richardson's Fauna Bor. Amer., vol. 4, 1837,
 pp. 160-161.
Melanophila immaculata MANNERHEIM, Bull. Soc. Imp. Nat. Moscou, vol.
 10, no. 8, 1837, p. 70.
Buprestis longipes SAY, Journ. Acad. Nat. Sci., Phila., vol. 3, 1823, p. 164.
Melanophila longipes MANNERHEIM, Bull. Soc. Imp. Nat. Moscou, vol. 10,
 no. 8, p. 7.—CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867,
 p. 581 (separates p. 157).—GUNDLACH, Contribucion a la Entom. Cuba,
 vol. 3, pt. 5, 1891, p. 164, no. 1853.

Form broadly elongate and strongly depressed, broadly rounded in front and strongly acuminate behind, uniformly black above and

beneath, feebly shining, and rarely with a metallic reflection; beneath sparsely pubescent.

Head flat or feebly convex, with the sides obliquely narrowed to the vertex; front and vertex without impressions or carinae; surface densely and coarsely punctate, the punctures shallow, oblong, confluent, irregular in shape, and with the bottoms coarsely, densely granulose; eyes moderately large, feebly convex, and slightly closer together on the vertex than at bottom; epistoma broadly arcuately emarginate in front, forming an obtuse tooth on each side of the emargination. Pronotum transverse, nearly one and one-half times as wide as long, widest at apical third, slightly narrower behind than in front; sides broadly rounded at apical third, then obliquely attenuate to the posterior angles, which are rectangular, the marginal line distinct posteriorly; anterior margin deeply arcuately emarginate, with a distinct angulated lobe at middle; base bisinuate, with the median lobe large, broadly rounded, and strongly elevated near the scutellum; disk with a broad median longitudinal groove, feebly impressed anteriorly, obsolete at middle, and terminating in a round deep puncture in front of scutellum, sometimes with an obsolete depression on each side of the median line; surface densely, coarsely granulose at middle, with a few obsolete punctures intermixed, at the sides the punctures are shallow, coarser, and confluent, the sides forming a network of irregular polygonal areas, the bottoms of which are densely granulose. Scutellum small, and the surface coarsely and densely granulose. Elytra wider than pronotum at base; sides obtusely angulate at base, broadly rounded at humeri, nearly parallel to apical third, then strongly, accurately attenuate to the tips, which are very acute; lateral margins finely serrate posteriorly; humeri not prominent; surface with a broad deep depression between the base and humeri, and densely, coarsely scabrous. Abdomen beneath with posterior margin of segment smooth, and the surface coarsely but not deeply punctate, the punctures coarser, and open posteriorly on the basal segments, becoming merely transverse crenulate lines toward the sides and apex; last segment broadly arcuately emarginate at apex, the angles acute but not prominent, and with an obsolete serrate subapical ridge. Metasternum more densely punctured than abdomen, the punctures round, with the sides well defined. Prosternum strongly convex, the anterior margin nearly truncate, and the surface coarsely and deeply punctate anteriorly, becoming transversely rugose posteriorly; prosternal process feebly convex, sides narrowly margined, the surface very coarsely punctate, abruptly expanded behind the coxal cavities and with an acute tooth at apex. First joint of the posterior tarsi nearly as long as the following three joints united.

Length, 7.5-11 mm.; width, 3-4.5 mm.

This is a very common circumpolar species found throughout the greater part of North America, Europe, and Siberia. It is closely allied to *notata* Castelnau and Gory, but can always be distinguished from that species by the head being very densely punctured, strongly opaque, and never shining as in *notata*, and the elytra is never ornated with yellow markings. It is reported as living in various species of spruce, pine, and fir.

It was first described by De Geer from an unknown locality, and later from Europe under a number of different names by various authors. Eschscholtz (1829) places *appendiculata* Fabricius in his new genus *Melanophila*. Say (1823) described the same species from Pennsylvania and the Western States under the name of *longipes*, and this name has been used in recording the species from the West Indies.

Chevrolat (1867) records the species from Cuba, in the collections of Gundlach and Poey. Gundlach (1891) records collecting it at "Brazo del Cauto," Santiago de Cuba.

Specimens have been examined from the following West Indian localities. Coll. S. C. Bruner: Camaguey, Cuba, Nov. 11, 1921 (Angelica Prieto). Coll. British Mus.: Two specimens labeled "Haiti, Saunders 74-18." This species is not represented in the Poey collection in Philadelphia, but there is a single example, labeled No. 1053, in the Gundlach Museum in Habana, which has not been examined by the writer.

Genus TETRAGONOSCHEMA Thomson

Tetragonoschema THOMSON, Archiv. Entom., vol. 1, 1857, p. 116.—KERRMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 3, 1903, pp. 168-169.

Pachypyga STEINHEIL, Atti. Soc. Ent. Ital., vol. 5, 1872, p. 564.

Head rectangular, front depressed at middle and not narrowed by the insertion of the antennae; epistoma narrow, short, and feebly emarginate at the middle; antennal cavities rather large, rounded, not concealed under a carina, and situated rather close to the inner margin of the eyes. Antennae moderately long; first joint thick and clavate; second and third short, obconic, and equal to each other in length; fourth a little longer and triangular; following joints rather robust, triangular, dentate on the inner side and armed with a terminal poriferous fovea. Eyes large, elliptical, and parallel. Pronotum wider than long, bisinuate in front, with the median lobe angulate; sides more or less rounded, with the posterior angles straight or obtuse; base distinctly sinuate. Scutellum triangular. Elytra short, sinuate, subparallel, truncate at the base, broadly and separately rounded at apex, and not covering the pygidium, which is concave. Sternal cavity formed by the mesosternum and metasternum, the lateral branches of the former subcontiguous. Meta-

sternum truncate in front and grooved at the middle. Prosternum with the anterior margin feebly emarginate in front; prosternal process flat; and acuminate at apex. Posterior coxae dilated internally; anterior margin feebly sinuate; posterior margin oblique. Legs feebly robust; femora and tibiae normal; tarsi moderately long. Abdomen short and convex; the last segment in the male with a transverse carina, and sinuate at the middle, the female with a large transverse depression. Body flat, short, and rectangular.

This genus was erected by Thomson (1857) for *chrysomelina* from Haiti, which is a synonym of *quadrata* Buquet. Steinheil (1872) erected the genus *Pachypyga* for a new species *undata* from the Argentine Republic, which is supposed to be congeneric with *quadrata* Buquet. So far, only six species have been described in this genus, four from South America, one from Guatemala, and the other one from Haiti.

TETRAGONOSCHEMA QUADRATA (Buquet)

Anthaxia quadrata BUQUET, Rev. Zool., 1841, pp. 194-195.

Tetragonoschema chrysomelina THOMSON, Archiv. Entom., vol. 1, 1857, p. 116, pl. 10, fig. 2.

The following is a translation of Buquet's original description:

Cyaneous, shining; elytra uneven and marked with three excavations; antennae, legs and abdomen greenish-bronzy. Length, 4 mm.; width, 2.75 mm.

Brilliant dark blue above. Head wide, finely reticulate and nearly covered with a very feeble network, and with a distinctly marked broad longitudinal groove in the middle. Eyes rather large and of a brownish color. Antennae brilliant green. Thorax very narrow at base, convex, nearly two times as wide as the head at the extremity, with a transverse groove, and bordered at the lower part by a brilliant, smooth, narrow line, which very distinctly detaches it from the elytra. Scutellum triangular, and longer than wide. Elytra nearly as wide as long, flat, parallel, uneven, and cut off squarely at base, rounded at the apex, and each elytron with three deep transverse impressions; the first near the scutellum, and interrupted in the middle by a longitudinal costa; the second a little behind the first; and the third situated near the apex; these are covered with a very fine reticulation, and bordered besides in their entire length. Body beneath finely punctate, and also the legs, which are a brilliant green. It has been given to me by Mr. Petit de la Sausaye, as having been found in Santo Domingo.

The species was first described by Buquet (1841) from Santo Domingo. Thomson (1857) described the same species under the name *chrysomelina* from Haiti, for which he erected the new genus *Tetragonoschema*. The species seems to be rare in collections, as no specimens have been available for examination, and Dr. C. J. Gahan states that the species is not represented in the British Museum collection.

Genus *TRACHYS* Fabricius²²

Trachys FABRICIUS, Syst. Eleuth., vol. 2, 1801, p. 218-220.—ESCHSCHOLTZ, Zool. Atlas, vol. 1, 1829, p. 9 (reprint, p. 8).—SOLIER, Ann. Soc. Ent. France, vol. 2, 1833, pp. 311-312, pl. 12, fig. 30.—CASTELNAU and GOBY, Mon. Bupr., vol. 2, 1840, pp. 1-11, pls. 1-2.—LACORDAIRE, Gen. Col., vol. 4, 1857, p. 88.—KEEREMANS, Wytzman's Gen. Insectorum, fasc. 12, pt. 4, 1903, pp. 307-314.

Head rather convex, wide, and more or less grooved or concave, and strongly narrowed by the antennal cavities; epistoma constricted posteriorly by the antennal cavities, and emarginate in front; antennal cavities rather large, oblique, rounded behind, prolonged into a groove in front, and situated a short distance from the eyes. Antennae 11-jointed, the basal joints inserted in a groove between the eyes and epistoma, the groove not prolonged on the prosternum, the apical joints free while in repose; first and second joints thick; third to sixth slender, cylindrical; the following joints triangular, dentate on the inner margin, and armed with terminal poriferous foveae. Eyes large, oval, sometimes projecting, and more widely separated on occiput than in front. Pronotum much wider than long, narrower in front than behind; anterior margin arcuately emarginate, with the apical angles acute; sides narrowed anteriorly; base strongly bisinuate. Scutellum very small or invisible. Elytra broad, attenuate posteriorly, and rounded at apex; humeri prominent and sometimes extending into a longitudinal carina along the lateral margin and at some distance from it. Sternal cavity formed by the mesosternum and metasternum, the lateral branches of the former short and very indistinct. Metasternum feebly, arcuately emarginate in front. Prosternum short, wide, rounded at apex, and the anterior margin armed with a more or less broad lobe. Middle coxae a little more widely separated than the anterior ones; posterior ones usually dilated externally. Legs slightly robust and not lodged in depressions beneath; femora rather thick; tibiae slender, straight or feebly arcuate, and in repose not concealed in grooves in the femora; tarsi very short, the joints enlarged and lobed, the first joint longer than the following; tarsal claws strongly toothed at base. Body short, suboval, or pentagonal.

This genus contains a large number of very small leaf-mining forms. It is distributed throughout the entire world with the exception of the Nearctic Region. The species of the genus reach their highest development in the Indo-Malaysian Region, but a few spe-

²² Since submitting this article for publication there has appeared an article by Dr Jan Obenberger (Sborník Entomologického Oddělení Národního Musea v Praze, vol. 1, 1923, p. 41), in which he places *Liua guadeloupensis* Fleutiaux and Sallé in his new genus *Neotrachys*.

cies have been described from America, including one from the Guadeloupe Islands. The American species are not entirely congeneric with the species from Malaysia and probably should form a new genus, but until more material is available for study it is advisable to retain them in the present genus.

TRACHYS GUADELOUPENSIS (Fleutiaux and Sallé)

Liua guadeloupensis FLEUTIAUX and SALLÉ, Ann. Soc. Ent. France, ser. 6, vol. 9, 1890, pp. 404-405 (separates pp. 54-55).

Trachys chevrolati KERREMANS, Ann. Soc. Ent. France, vol. 65, 1896, pp. 26-27.

Elongate, moderately convex, broadly rounded in front, attenuate posteriorly, and slightly narrower behind than in front, glabrous and strongly shining, uniformly aeneous above; beneath piceous, with a slightly aeneous tinge.

Head broad, nearly flat, feebly longitudinally impressed on the front, deeply transversely impressed behind the epistoma, with a round deeper impression behind the antennal cavities; surface sparsely and irregularly punctate, the punctures shallow and rather coarse on the occiput, but becoming nearly obsolete toward the epistoma; intervals smooth; epistoma wide between the antennal cavities (about three times as wide as the cavities), the anterior margin deeply, arcuately emarginate and strongly elevated; antennae rather short and entirely piceous. Pronotum slightly convex, two and one-half times as wide as long at middle, distinctly narrower in front than behind, and widest at base; sides obliquely arcuate from base to anterior angles and narrowly margined; anterior angles acute; posterior angles nearly rectangular and slightly projecting; anterior margin broadly arcuately emarginate, with an obsolete lobe at middle; base transversely truncate to near middle of elytron, then feebly sinuate and turning obliquely backward to the scutellum, in front of which it is broadly rounded; surface narrowly impressed along lateral margin, and with a broad, shallow impression near the posterior angles; punctuation similar to that on the head. Scutellum very small and triangular. Elytra moderately convex, distinctly wider than pronotum at base; humeral angles broadly rounded; sides feebly obliquely attenuate to behind the middle, then arcuately attenuate to the tips, which are conjointly narrowly rounded, with the lateral margin entire; each elytron with a broad, shallow impression at base, and a more elongate one behind the humerus close to the lateral margin, causing an obsolete elevation near the middle at lateral margin, which is less elevated than the humerus; surface without lateral carina, rather densely and irregularly punctate, the punctures coarse and stelliform at base, becoming more obsolete at the apex; intervals smooth. Abdomen beneath

coarsely and sparsely punctate, the punctures very shallow, ocellate, oval at middle, but becoming more elongate at the sides of first segment, and sparsely clothed with a few inconspicuous hairs; intervals finely and densely granulose; last segment broadly rounded at apex. Prosternum sparsely, coarsely punctate; anterior margin broadly rounded; prosternal process broad, slightly expanded behind the coxal cavities, and broadly rounded at apex.

Length, 2.4 mm.; width, .75 mm.

This species was described and placed in the genus *Liua* by Fleutiaux and Sallé from material collected by Delauney during August at Camp Jacobs, in the southern part of Guadeloupe. Kerremans (1896) described *Trachys chevrolati* from Guadeloupe from material in the Chevrolat collection. I have carefully compared the descriptions of *Liua guadeloupensis* and *Trachys chevrolati* and find no differences, and since *L. guadeloupensis* was unknown to Kerremans at the time he described *T. chevrolati*, I have placed his species as a synonym of *guadeloupensis*.

The above description was made from eight specimens collected at Gourbeyre, which is near the type locality in Guadeloupe, and kindly loaned to me by the American Museum of Natural History. (Two of these specimens have been donated to the United States National Museum collection.) These specimens agree very well with the description given by Fleutiaux and Sallé for this species, but they belong to the genus *Trachys*, which can be easily distinguished from the genus *Liua* by the absence of grooves on the prosternum for the reception of the antenna while in repose.

Genus BRACHYS Solier

Brachys SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 312-313.—LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 86-87.—DEJEAN, Cat. Coleopt., 2 ed., 1833, p. 83.—CASTELNAU and GORY, Mon. Bupr., vol. 2, 1840, pp. 1-9.—GORY, Mon. Bupr., Suppl., vol. 4, 1841, pp. 329-349.—LECONTE, Trans. Amer. Philos. Soc., new ser., vol. 11, 1859, pp. 250-253.—KERREMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 4, 1903, pp. 324-327.

Head moderately large, front grooved; epistoma bisinuate in front, and strongly narrowed by the antennal cavities; antennal cavities large, oblique, rounded behind, and prolonged into a groove in front, and situated some distance from the eyes. Antennae 11-jointed; first joint thick and obconic; second cylindrical, nearly as long and thick as the first; third and fourth subequal in length, more slender and shorter than the second; the following joints dentate on the inner side, and armed with terminal poriferous foveae. Eyes rather large, oval, subparallel, and sometimes a little more widely separated on vertex than at front. Pronotum trapeziform, wider than long; disk convex, depressed at sides and base; sides

obliquely narrowed anteriorly; anterior margin nearly straight; base strongly bisinuate, with a distinct median lobe. Scutellum large, triangular, and wider than long. Elytra broad and short, abruptly attenuate behind; humeri prominent, and often extending into a longitudinal carina along the lateral margin, the disk sometimes with distinct longitudinal carinae. Sternal cavity formed by the mesosternum and metasternum, the lateral branches of the former very short, transverse, and compressed upon the side or invisible. Metasternum broadly emarginate in front. Prosternum truncate in front, with the sides deeply grooved near the margin for the reception of the antennae; prosternal process with a large, deep, elongate fovea at middle. Middle coxae a little more widely separated than anterior ones; posterior pairs are but slightly dilated internally, narrowest at middle, and broader externally. Legs very contractile, and while in repose are lodged in depressions beneath; femora feebly swollen, the anterior and middle pairs arcuate at apex; tibiae slender and cylindrical, usually straight, but in a few cases arcuate; tarsi very short; tarsal claws toothed at base. Body usually broad and ovate, attenuate in front and acuminate behind.

The species of this genus are very numerous and their distribution heretofore has been confined to North, Central, and South America. The following new species extends the distribution to the West Indies. The adults are short, ovate and of various metallic colors, the dorsal parts usually ornated with pubescent designs, sometimes glabrous and occasionally with tufts of erect hairs, and are found during the warmer part of the day on flowers, or feeding on the foliage. The larvae are miners in the leaves of various trees and plants.

BRACHYS THOMAE, new species

Broadly cuneiform, distinctly longer than wide, broadly rounded in front, more acuminate posteriorly, and narrower behind than in front, shining, piceous, with feeble purplish and cupreous reflections, and ornated with indistinct irregular pubescent designs; beneath uniformly piceous.

Head feebly convex, longitudinally grooved from occiput to epistoma, the groove very broad and deep on the front, but becoming narrower and not as deeply impressed on the occiput, when viewed from above the front is deeply emarginate, and each side forming a semicircle with the eyes; surface densely, finely granulose, and sparsely clothed on the vertex, along the eyes, and behind the epistoma with a few recumbent cinereous hairs; epistoma narrow between the antennal cavities (about one-half as wide as the cavities),

feebly concave and without transverse carina in front. Pronotum moderately convex, two times as wide as long at the middle, distinctly narrower in front than behind, widest at base; sides strongly arcuately attenuate from base to anterior angles; anterior margin truncate, without a median lobe; base transversely truncate to middle of elytron, then turning obliquely backward to the scutellum, in front of which it is feebly arcuately emarginate; posterior angles nearly rectangular, surface broadly depressed along the sides, the depression extending obliquely from the anterior angles to the base at middle of elytron, then transversely along the base, causing the anterior median part of the disk to be regularly convex, each side with a short straight indistinct lateral carina, the surface is also densely, finely granulose, with numerous shallow ocellate punctures in the depressed areas, and sparsely clothed with moderately long recumbent cinereous hairs. Scutellum obsoletely granulose broadly triangular, with the anterior margin feebly rounded. Elytra not quite as wide as pronotum at base, widest just behind the humeral angles, which are obtusely angulated; sides strongly sinuate at basal third, then strongly obliquely attenuate to the tips, which are conjointly, broadly rounded, with the lateral margins entire; humeri prominent; each elytron with a moderately deep broad depression at the base, and an elongate one behind the humerus between the lateral carina and lateral margin, and with a strongly elevated, sinuate smooth lateral carina extending from the humeral angle to near the apex; the surface with two fine longitudinal lines of fulvous hairs extending from the base to near the middle, and sparsely clothed with recumbent cinereous hairs (with a few fulvous ones intermixed), the cinereous pubescence tending to form obsolete fasciae at middle and apical fifth; surface finely, sparsely punctate, with a longitudinal row of larger punctures on each side of the longitudinal lines of hairs; intervals obsoletely rugose on basal part, but becoming smoother toward apex. Abdomen beneath strongly convex, sparsely and ocellate-punctate, the punctures large, obsolete, open on the one side, and from each one arises a short recumbent cinereous hair, the hairs more conspicuous toward the sides; intervals finely and densely granulose; last segment subtruncate at apex, with the margin very finely dentate. Front and middle tibiae strongly arcuate, the latter with a distinct tooth at the apex (hind tibiae missing).

Length, 3 mm.; width, 1.4 mm.

Type locality.—La Belle, St. Thomas, West Indies.

Type.—Carnegie Museum, Pittsburgh.

Described from a unique specimen received from the Carnegie Museum.

In general form this species resembles *Brachys bellus* Fisher from Panama, but can be easily distinguished from that species by the color being entirely different, and the pronotum having distinct lateral carinae.

Genus TAPHROCERUS Solier

Taphrocerus SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 314-315.—KERREMANS, Wytsman's Gen. Insectorum, fasc. 12, pt. 4, 1903, pp. 327-328.

Head large, moderately convex and more or less grooved on front; epistoma broadly emarginate in front, strongly narrowed by the antennal cavities, and separated from the front by a transverse carina; antennal cavities large, oblique, rounded behind, prolonged into a groove in front, and situated at some distance from the eyes. Antennae rather long, and while in repose inserted in a groove in the prosternum; first joint robust, elongate and somewhat arcuate; second robust, slightly shorter than the first; third and fourth and sometimes the fifth elongate, longer and more slender than the second; following joints triangular, dentate on the inner margin, and armed with terminal poriferous foveae. Eyes moderately large, oval, not touching the pronotum, sometimes projecting, and parallel or feebly oblique on the inner margin. Pronotum wider than long; disk sometimes very uneven, with or without lateral carina; anterior margin usually truncate; sides more or less sinuate; base strongly bisinuate, with a distinct median lobe, which is more or less emarginate. Scutellum triangular, the anterior margin sometimes rounded, and apex rather acute. Elytra rather elongate and moderately convex, strongly acuminate posteriorly, sometimes with a distinct lateral carina, and the surface glabrous or pubescent. Sternal cavity formed by the mesosternum and metasternum, the lateral branches of the former very small. Metasternum rather deeply and angularly emarginate in front. Prosternum broadly rounded in front; prosternal process strongly constricted by the coxal cavities, behind which it is dilated, with the apex acute. Middle coxae a little more widely separated than the anterior ones; posterior pair very short, concave, and feebly dilated internally. Legs rather robust and not lodged in depressions beneath; anterior and middle femora feebly swollen, and arcuate at apex, the posterior pair more slender and nearly straight; anterior and middle tibiae cylindrical and more or less arcuate, the posterior ones less arcuate; tarsi rather longer than usual for this group; tarsal claws dentate. Body elongate and broadly agriliform.

This genus contains about 50 described species, which are confined in their distribution to the Western Hemisphere. So far seven species have been found in the West Indies, of which five are de-

scribed as new in the present paper. The species are elongate, broadly agriliform, and usually of a piceous or aeneous color. They are closely allied to each other and very difficult to describe in such a way that they can be easily recognized, but the species from the West Indies can be separated by the characters given in the following table:

KEY TO THE SPECIES

1. Surface above unicolored..... 2.
Surface above bicolored..... 6.
2. Elytra with lateral carina..... 3.
Elytra without lateral carina..... 4.
3. Surface above aeneous..... *laesicollis* Chevrolat.
Surface above piceous..... *tennis* Fisher.
4. Pronotum widest at base..... *subglaber* Fisher.
Pronotum widest in front of base..... 5.
5. Pronotum widest at apical third, then obliquely attenuate to posterior angles; head transversely truncate in front when view from above; color above aeneo-cupreous..... *aeneocupreus* Fisher.
Pronotum widest at basal third, where it is abruptly constricted and then parallel to the posterior angles; head broadly rounded in front when viewed from above; color above aeneo-piceous..... *timidus* Chevrolat.
6. Sides of pronotum strongly constricted at base, which is broadly depressed in front of scutellum; head and anterior part of pronotum cupreous, elytra dark shining green at base, becoming bronzy and strongly opaque on apical two-thirds..... *elegans* Fisher.
Sides of pronotum arcuately rounded; base not depressed in front of scutellum; head and pronotum dark aeneous, elytra piceous, shining.
aeneocollis Fisher.

TAPHROCERUS LAESICOLLIS Chevrolat

Taphrocerus laesicollis CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 1867, p. 587; (separate p. 163).—GUNDLACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, pp. 170-171.

The following is a translation of Chevrolat's original description:

Allied to *Brachys gentilis* Dejean and *alboguttatus* Gory; aeneous, somewhat shining, vaguely and deeply punctate; head punctate, anteriorly deeply sulcate and posteriorly more narrowly sulcate; eyes black with a golden margin; thorax transverse, vaguely punctate, in front straight, externally margined, and from there up to the base sulcate, on the sides obliquely bicarinate (the carina externally excavated), declivous anteriorly, nearly straight toward base, sometimes very freely arcuate externally and subemarginate at middle, with two deep subquadrate median sulci, transversely limited on the disk; scutellum subrotund and shining; elytra elongate, toward the base feebly wider, and then gradually attenuate, separately obtusely rounded, at basal margin, suture and scutellum margined, humeral callosity elevated and produced into a longitudinal costa, minutely granulose, punctate-striate, the sutural stria inversely sulcate, the striae beyond middle obsolete, and the punctures in the striae irregular, posteriorly corinaceous and more shining; body beneath and legs dark aeneous. Length, 3.75 mm.; width, 1 mm. Habitat, Cuba. Collections of Gundlach and Poey.

Gundlach (1891) states that: "Chevrolat records receiving a specimen from me but the species is not represented in my collection." The species is not represented in either the Poey collection in Philadelphia nor the Gundlach Museum in Habana, so I have been unable to examine any specimens of this species, and it is included in the key from the characters given in the original description.

This species can be separated from all the described West Indian species of this genus, with the exception of *tenuis* Fisher, by the elytra having a distinct lateral carina, extending from the humeri backward for a short distance. From *tenuis* it can be separated by the color, which is recorded as aeneous, while in that species it is entirely piceous, with only a slight aeneous tinge when viewed in certain lights.

TAPHROCERUS TENUIS, new species

Form elongate, subcylindrical, strongly attenuate posteriorly, moderately convex above, shining, uniformly piceous above, with a very feeble aeneous tinge in certain lights, and without pubescent spots; beneath of the same color as above.

Head slightly narrower than pronotum at base, and when viewed from above is transversely truncate in front, with a longitudinal groove extending from the epistoma to the occiput, the groove forming an elongated triangular space behind the epistoma, and becoming obsolete on the occiput; front wide, with the sides more widely separated above than in front, and feebly convex between the eyes; surface glabrous, finely and obsoletely reticulate, with a few shallow, irregularly placed punctures intermixed; eyes oval, equally rounded at both ends, strongly convex, and slightly projecting; epistoma feebly elevated, and rather narrowly and deeply arcuately emarginate in front. Pronotum moderately convex, two times as wide as long, apex and base about equal in width, widest at about the basal third; sides when viewed from above are obliquely dilated to basal third, then abruptly narrowed and feebly arcuately emarginated to the posterior angles, which are nearly rectangular; anterior margin nearly truncate; base truncate to middle of elytron, then turning obliquely backward to the scutellum, in front of which it is arcuately emarginate; surface with a shallow, broad transverse depression along anterior margin, connected on each side to a broad depression at lateral margin, which extends obliquely backward to the base, but not transversely along base in front of scutellum, causing the surface near posterior angles to be feebly gibbose, surface with a few scattered ocellate punctures, from the center of which arises a short inconspicuous cinereous hair; intervals finely and densely reticulate. Scutellum triangular, rounded in front, with the surface nearly smooth. Elytra moderately convex, slightly

wider than pronotum at base; humeral angles obtusely angulated; sides feebly arcuately concave from the humeral angles to middle, where they are broadly rounded and about equal in width to the base, then strongly obliquely attenuate to the tips, which are separately rounded and feebly serrulate; humeri well developed; each elytron with a broad and rather deep basal depression, and a distinct lateral carina extending from the humeri to about basal third; surface with indistinct rows of shallow, feebly defined punctures, which are obsoletely granulose at the bottom, the punctures rather large at base, but becoming very fine and indistinct toward the apex; intervals somewhat rugose at base, but nearly smooth at the apical region, and very sparsely clothed with a few short inconspicuous hairs. Abdomen beneath moderately convex, sparsely and rather obsoletely punctate, the punctures very shallow, oblong, and open on the one side, each puncture bearing a short recumbent cinereous hair; intervals densely and obsoletely reticulate; last segment broadly rounded at apex, with the apical groove deep, and following the outline of the lateral margin, but not extending to it. Prosternum rather coarsely punctate. Front and middle tibiae moderately arcuate.

Length, 3.2 mm.; width 1 mm.

Type locality.—Trinidad, West Indies.

Type and paratypes.—Cat. No. 26815, U.S.N.M.

Described from five specimens collected by August Busck, June 12 and 21.

This species can be easily distinguished from all the other species of this genus described from the West Indies (except *laesicollis* Chevrolat), by the elytra having a distinct lateral carina. From *laesicollis* it can be separated by the color, which is piceous, and not aeneous, as in that species.

TAPHROGERUS SUBGLABER, new species

Form rather broadly elongate, strongly attenuate posteriorly, moderately convex above; shining, uniformly piceous, with a strong aeneous or olivaceous tinge, and without pubescent spots; beneath slightly more aeneous than above.

Head considerably narrower than pronotum at base, and when viewed from above is transversely truncate in front, with a feeble emargination at middle, with a longitudinal groove extending from the occiput to epistoma, the groove rather broadly and deeply impressed on the front, but becoming obsolete on the occiput; front wide, with the sides more widely separated above than in front, and feebly convex between the eyes; surface nearly smooth, with a few very shallow, irregularly placed punctures, and very sparsely clothed with short, inconspicuous, cinerous hairs; eyes large, oval, about

equally rounded at both ends, strongly convex and slightly projecting; epistoma flat and rather narrowly and deeply arcuately emarginate in front. Pronotum moderately convex, two times as wide as long, distinctly narrower in front than behind, widest at base; sides when viewed from above are parallel at apical angles, then obliquely dilated to the base; anterior margin feebly arcuate; base nearly transversely truncate to middle of elytron, then turning obliquely backward to the scutellum, in front of which it is feebly arcuately emarginate; surface with a narrow transverse depression along the anterior margin, connected at each side to a broad concave depression at the lateral margin, which extends obliquely backward and then transversely along base, these depressions cause the surface to be broadly transversely elevated on the disk anteriorly, sparsely irregular ocellate-punctate, the punctures more widely separated on the disk, and from the center of each arises a short inconspicuous cinereous hair; intervals nearly smooth (obsoletely reticulate under a high-power lens). Scutellum triangular, feebly rounded in front, with the surface finely and obsoletely reticulate. Elytra moderately convex, not quite as wide as pronotum at base; humeral angles obtusely angulated; sides strongly arcuately concave from the humeral angles to middle, where they are broadly rounded and wider than at base, then strongly obliquely attenuate to the tips, which are conjointly broadly rounded and obsoletely serrulate; humeri well developed; each elytron with a deep, broad basal depression, and without a lateral carina; surface with distinct rows of shallow, feebly defined punctures, which are larger at the base but gradually becoming smaller toward the apex, where they are nearly obsolete, the bottom of each puncture is obsoletely granulose, with a short inconspicuous cinereous hair arising from the center; intervals smooth on disk, becoming feebly rugose at the sides, especially in the humeral regions. Abdomen beneath strongly convex, sparsely and rather obsoletely punctate, the punctures very shallow, rounded, open on the one side, larger and more closely placed on the first segment, but becoming very small on the last one, each puncture bearing a short recumbent cinereous hair; intervals finely and obsoletely reticulate; last segment broadly rounded at apex, with the apical groove following the outline of the lateral margin, but not extending to it. Prosternum densely and finely reticulate-punctate. Front and middle tibiae moderately arcuate.

Length, 3.5 mm.; width, 1.35 mm.

Type locality.—Montserratt, Trinidad, West Indies.

Type and paratypes.—Cat. No. 26816, U.S.N.M.

Described from four specimens collected by August Busck, two of which were collected at the type locality, June 28 and 29, one at Port

of Spain, Trinidad, June 19, and the other one simply labeled "Trinidad, W. I. June."

This species can be distinguished from all the other species of this genus described from the West Indies by the shape of the pronotum, which is widest at the base and slightly wider than the base of the elytra. It resembles somewhat *aeneocollis* Fisher and *tenuis* Fisher, but it is much broader in proportion to its length than either of these two species.

TAPHROCERUS ELEGANS, new species

Male.—Elongate, strongly attenuate posteriorly, moderately convex and strongly flattened above; head with the occiput and vertex cupreous, front green; pronotum cupreous anteriorly, becoming olivaceous toward the base; scutellum dark green; elytra dark shining green at base, becoming a dull bronzy color and strongly opaque on the apical two-thirds, and without pubescent spots; beneath piceous with a strong aenous tinge.

Head nearly as wide as pronotum at base, and when viewed from above is transversely truncate in front, with a feeble emargination at the middle; and broadly flattened behind the epistoma, causing two obsolete gibbosities on the front, with a longitudinal groove extending from the occiput to the transverse flattened area behind the epistoma, the groove obsolete on the occiput, but becoming deeper and broader on the front, which is wide, with the sides more widely separated above than in front, and nearly flat between the eyes; surface finely and densely granulose, with a few moderately deep punctures intermixed, the punctures becoming denser and more confused behind the epistoma, where the surface is also sparsely clothed with short cinnereous hairs; eyes large, oval, about equally rounded at both ends, strongly convex and feebly projecting; epistoma flat, and deeply, arcuately emarginate in front. Pronotum moderately convex, nearly two times as wide as long, apex and base about equal in width, widest at about the basal third; sides when viewed from above are obliquely dilated to the basal third, then abruptly narrowed, and arcuately emarginate to the posterior angles, which are rather obtuse; anterior margin broadly arcuate; base transversely truncate to middle of elytron, then turning obliquely backward to the scutellum, in front of which it is feebly, arcuately emarginate; surface with a narrow transverse depression along the anterior margin, connected at each side to a broad concave depression along the lateral margins, which extends to the posterior angles and then transversely along the base, these depressions causing the surface to be broadly gibbous on the disk, sparsely, irregularly ocellate-punctate, the punctures nearly obsolete on the disk, but becoming denser and larger in the depressed areas, sparsely clothed with a few incon-

spicuous, recumbent, cinereous hairs; intervals finely and very densely granulose. Scutellum triangular, feebly rounded in front, with the surface obsoletely granulose. Elytra moderately convex, strongly flattened on top, distinctly wider than pronotum at base; humeral angles obtusely angulated; sides strongly arcuately concave from the humeral angles to the middle, where they are broadly rounded and slightly wider than at base, then rather strongly, obliquely attenuate to the tips, which are conjointly broadly rounded, and obsoletely serrulate; humeri well developed; each elytron with a deep, rather broad basal depression and without a lateral carina; surface with distinct rows of punctures, which are large and rather deep at the base, but gradually becoming smaller toward the apex, where they are nearly obsolete, sparsely clothed with a few very short, inconspicuous cinereous hairs, which tend to form longitudinal rows, and are only noticeable on the opaque area; intervals finely and densely granulose, except for a transverse area at apical third, where the surface is more shining, the apical two-thirds so densely granulose that the surface is strongly opaque. Abdomen beneath strongly convex, sparsely and rather coarsely punctate, the punctures shallow, oblong, and open on the one side, each puncture bearing a very short recumbent cinereous hair; intervals densely and obsoletely reticulate; last segment broadly rounded at apex, with the apical groove more acutely rounded than apex, and extending to the lateral margins. Prosternum finely and densely rugose. Front and middle tibiae strongly arcuate.

Length, 3.5 mm.; width, 1.4 mm.

Type locality.—El Yunque, Porto Rico.

Type.—Cat. No. 26818, U.S.N.M.

Described from a single male example received from G. N. Wolcott of the Porto Rico Experiment Station and which was collected at El Yunque, Porto Rico, by R. T. Cotton, March 23, 1917. El Yunque is a mountain 3,790 feet high, in the northeastern part of the island, between Mameyes and Fajardo.

TAPHROCERUS AENEOCOLLIS, new species

Form elongate, subcylindrical, strongly attenuate posteriorly, moderately convex above, and feebly shining; head and pronotum dark olivaceo-aeneous; elytra piceous, without pubescent spots; beneath piceous, with a feeble aeneous tinge.

Head slightly narrower than pronotum at base, and when viewed from above is transversely truncate, with a longitudinal groove extending from the occiput to a somewhat flattened transverse area in front of epistoma, the groove obsolete on the occiput, but becoming more broadly and deeply impressed on the front, which is wide, with

the sides more widely separated above than in front, and feebly convex between the eyes; surface finely and densely granulose, with a few large, shallow, irregularly placed punctures intermixed, sparsely clothed with a few very short cinereous hairs behind the epistoma; eyes large, oval, more acutely rounded beneath than above, rather strongly convex, but only feebly projecting; epistoma flat, and rather narrowly and deeply arcuately emarginate in front. Pronotum moderately convex, nearly two times as wide as long, apex and base about equal in width, widest at about the middle; sides when viewed from above are regularly arcuate; anterior margin nearly truncate; base transversely truncate to middle of elytron, then turning obliquely backward to the scutellum, in front of which it is feebly arcuately emarginate; surface with a narrow transverse depression along anterior margin, connected on each side to a broad depression at lateral margin, this depression extending obliquely backward and becoming nearly obsolete at base, and not extending transversely in front of scutellum, surface with a few scattered ocellate punctures, from the center of which arises a short inconspicuous cinereous hair; intervals finely and densely reticulate. Scutellum triangular, feebly rounded in front, with the surface obsoletely reticulate. Elytra moderately convex, slightly wider than pronotum at base; humeral angles obtusely angulated; sides strongly arcuately concave from the humeral angles to the middle, where they are about equal in width to the base, then strongly obliquely attenuate to the tips, which are conjointly broadly rounded and feebly serrulate; humeri well developed; each elytron with a rather shallow, broad basal depression, and without a lateral carina; surface with distinct rows of shallow, feebly defined punctures, which are obsoletely granulose at the bottom and from the center of which arises a short, inconspicuous, cinereous hair, the punctures larger at the base but becoming gradually smaller toward the apex, where they are nearly obsolete; intervals feebly rugose at the sides, but becoming smoother on the disk. Abdomen beneath moderately convex, sparsely and rather obsoletely punctate, the punctures very shallow, oblong, open on the one side, larger and more closely placed on the first segment, but becoming small and indistinct on the last one, each puncture bearing a short recumbent cinereous hair; intervals finely and obsoletely reticulate; last segment broadly rounded at apex, the apical groove following the outline of lateral margin but not extending to it. Prosternum finely and densely reticulate-punctate. Front and middle tibiae moderately arcuate.

Length, 3 mm.; width, 1 mm.

Type locality.—Trinidad, West Indies.

Type and paratype.—Cat. No. 26817, U.S.N.M.

Described from two specimens collected by August Busck. The type is labeled "Trinidad, W. I., June," and the paratype "Port of Spain, Trinidad, June 19."

The species is closely allied to *subglaber* Fisher, but can be easily distinguished from that species by the shape of the pronotum, which is widest at about the middle and arcuately rounded, while in *subglaber* it is obliquely dilated to the base, where it is the widest. It might also be confused with *tenuis* Fisher, but that species has a distinct lateral carina on the elytra.

TAPHROCERUS AENEOCUPREUS, new species

Form rather broadly elongate, strongly attenuate posteriorly, moderately convex above, shining, uniformly aeneous, with a slight cupreous tinge in certain lights, and without pubescent spots: beneath more olivaceo-aeneous than above.

Head slightly narrower than pronotum at base, and when viewed from above is transversely truncate in front, with an obsolete longitudinal groove, which is shallow and broad near the epistoma, but becoming very narrow and resembling a carina on the vertex and occiput; front wide, with the sides nearly parallel and very feebly convex between the eyes; surface densely, coarsely granulose, coarsely and sparsely punctate, the punctures very shallow and distinctly separated, and clothed with a few very short, cinereous hairs; eyes large, elongate, more acutely rounded beneath than above, strongly convex, and slightly projecting; epistoma slightly elevated and broadly arcuately emarginate in front.

Pronotum moderately convex, two times as wide as long, apex and base nearly equal in width, widest at apical third; sides when viewed from above are strongly obliquely expanded from the anterior margin to apical third, then obliquely attenuate to the posterior angles, which are obtusely angulated; anterior margin obsoletely rounded; base truncate to middle of elytron, then turning obliquely backward to the scutellum, in front of which it is rather deeply arcuately emarginate; surface with a narrow, shallow, transverse depression along the anterior margin, and with a broader transverse depression behind the middle, connected on each side to the anterior depression, the surface with a few coarse widely separated punctures, from the center of which arises a short inconspicuous cinereous hair, the intervals finely and densely granulose. Scutellum triangular, rounded in front, acuminate behind, and with the surface finely, densely granulose. Elytra moderately convex, slightly wider than pronotum at base; humeral angles obtusely angulated; sides strongly sinuate from the humeral angles to middle, where they are broadly rounded and about equal in width

to the base, then obliquely attenuate to the tips, which are separately narrowly rounded and finely serrulate; humeri well developed; each elytron with a broad and rather deep basal depression, but without a lateral carina; surface with indistinct rows of coarse, shallow punctures, the punctures rather distinct on basal area, but becoming more indistinct toward the apex; intervals densely, coarsely granulose, more or less rugose, and clothed with a few short recumbent cinereous hairs, which are more numerous in the apical region. Abdomen beneath moderately convex, coarsely and sparsely punctate, the punctures very shallow, oblong, and open posteriorly, each puncture bearing a very short recumbent cinereous hair; intervals densely and obsoletely reticulate; last segment narrowly flattened and truncate at apex, with the apical groove deep and following the outline of the lateral margin, but not extending to it. Prosternum coarsely and densely reticulate. Front and middle tibiae slightly arcuate, the posterior pair nearly straight.

Length, 4 mm.; width, 1.25 mm.

Type locality.—Cayamas, Cuba.

Type and paratype.—Cat. No. 26819, U.S.N.M.

Described from two specimens collected by E. A. Schwarz, February 28.

This is one of the largest West Indian species, and is of a uniformly bronzy-coppery color above. It is allied to *laesicollis* Chevrolat, but can be separated from that species by the absence of the longitudinal lateral carina on the elytra.

TAPHROCERUS TIMIDUS Chevrolat

Taphrocerus timidus CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, pp. 587-588 (separates pp. 163-164).—GUNDLACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, 1891, p. 171, No. 1053.

Form elongate, subcylindrical, strongly attenuate posteriorly, moderately convex above, and rather shining; above uniformly piceous, with a distinct aeneous tinge, and without pubescent spots; beneath slightly less aeneous than above.

Head slightly narrower than pronotum at base, and when viewed from above is broadly rounded in front, with a narrow, feebly impressed longitudinal groove, extending from the epistoma to the vertex, but becoming obsolete on the occiput; front wide, with the sides more widely separated above than in front and feebly convex between the eyes; surface densely and rather coarsely granulose, coarsely, densely punctate, the punctures shallow and distinctly separated, and clothed with a few very short cinereous hairs; eyes elongate, more acutely rounded beneath than above, nearly flat and not projecting; epistoma flat and rather narrowly and deeply arcuately emarginate in front. Pronotum moderately convex, one and

one-half times as wide as long, apex and base about equal in width, widest at basal third; sides when viewed from above are feebly obliquely expanded from anterior margin to basal third, then abruptly constricted and parallel to the posterior angles, which are rectangular; anterior margin nearly truncate; base truncate to middle of elytron, then feebly oblique to the scutellum, in front of which it is truncate or feebly emarginate; surface with an obsolete transverse depression along the anterior margin, connected on each side to a broad depression at lateral margin, and then extending obliquely backward and connected to a broad transverse depression along the base, the surface rather coarsely and densely punctate, the punctures shallow, distinctly separated, and from the center of each arises a very short cinereous hair, the intervals rather coarsely and densely granulose. Scutellum subtriangular, truncate or feebly rounded in front, broadly rounded behind, and with the surface finely, densely granulose. Elytra moderately convex, slightly wider than pronotum at base; humeral angles obtusely angulated; sides strongly sinuate from humeral angles to middle, where they are broadly rounded and about equal in width to the base, then obliquely attenuate to the tips, which are conjointly broadly rounded and obsoletely serrulate; humeri well developed; each elytron with a broad and rather deep basal depression and without a lateral carina; surface with indistinct rows of shallow, irregularly placed stelliform punctures; intervals more or less rugose and clothed with a few short recumbent cinereous hairs. Abdomen beneath strongly convex, sparsely and coarsely punctate, the punctures shallow, open posteriorly, equally distributed over the first two segments, but on the posterior three segments they are arranged along the posterior margin, and each puncture bearing a short recumbent cinereous hair; intervals finely and coarsely reticulate; last segment broadly rounded at apex, with the apical groove deep, and following the outline of the lateral margin but not extending to it. Prosternum finely and densely reticulate. Front and middle tibiae slightly arcuate, the posterior pair straight.

Length, 3 mm.; width, 1 mm.

This species was described by Chevrolat from the central part of Cuba from material in the collections of Gundlach, Poey, and Chevrolat, and he writes that the insect is found on a species of rushes. Gundlach (1891) records collecting it on one of the rushes (*Juncus*, species) at Cienago de Zapata, Cuba.

The following Cuban material has been examined, and from which the above description was made. Coll. Amer. Mus. Nat. Hist.: One specimen from Cuba, collected 7 kilometers north of Viñales, September 16-24, 1913, by F. E. Lutz, the vegetation consisting of grasses and weeds (largely *Solanum* and *Bidens*) of pasture and

roadside in dry places. Coll. U. S. Nat. Mus.: One specimen received from S. C. Bruner labeled "Nagua, Oriente," collected July 7, 1922, by C. H. Ballou. No specimens of this species have been found in the Poey collection in Philadelphia, but Mr. Bruner reports that there is a single example labeled No. 1053 in the Gundlach Museum in Habana, but this specimen has not been examined by the writer.

Genus *LEIOPLEURA* H. Deyrolle

Leiopleura H. DEYROLLE, Ann. Soc. Ent. Belg., vol. 8, 1864, p. 219.—~~KERR-~~
MANS, Wytzman's Gen. Insectorum, fasc. 12, pt. 4, 1903, pp. 328-330.

Head narrow, declivous in front, moderately convex behind, and with the front grooved; epistoma broadly emarginate in front, narrow and elongate between the antennal cavities; antennal cavities large and nearly contiguous and extending almost to interior margin of the eyes. Antennae short and slender; first and second joints short and thick, the first slightly longer than the second; third to fifth elongate, very slender, and subequal in length to each other; the following joints abruptly dentate on the inner side, and armed with terminal poriferous fovea. Eyes moderately large, suboval, and parallel on the inner margin. Pronotum wider than long, narrower in front than behind; disk convex; sides impressed, with the margin sinuate or arcuate; base frequently depressed, strongly bisinuate, with a large median lobe. Scutellum large and triangular. Elytra broad, strongly convex, often strongly impressed at the sides behind the humeri, strongly attenuate posteriorly to the apex, which is separately or conjointly rounded. Sternal cavity formed by the mesosternum and metasternum, the lateral branches of the former invisible. Metasternum broadly emarginate or truncate in front. Prosternum with a deep oblique groove at the sides for the insertion of the antennae while in repose; anterior margin sometimes with a median lobe; prosternal process usually very broad, and broadly rounded at apex, and not constricted by the coxal cavities. Middle coxae a little more widely separated than the anterior ones; posterior coxae dilated internally, narrowest at middle, and feebly dilated externally. Legs rather robust and not lodged in depressions beneath; femora feebly swollen; tibiae slender, subcylindrical and nearly straight, the anterior and median ones feebly arcuate; tarsi very short and the joints nearly subequal in length; tarsal claws dentate at base. Body elliptical or oval, more or less elongate, and very convex above.

This genus was erected by Deyrolle and placed in his table for separating the genera of Malaysian *Trachytes*, without giving a further description, but in a footnote gives the following: "Type

due genre, *Brachys concinna* Gory, etc." The species of this genus are very numerous, and their distribution has been confined to the warmer parts of Mexico, Central and South America, with the exception of one species, which has been described from the West Indies.

LEIOPLEURA COMPACTILIS Chevrolat

Leiopleura compactilis CHEVOLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 588 (separates p. 164).—GUNDLACH, Contribucion a la Entom. Cuba, vol. 3, pt. 5, 1891, pp. 171-172, no. 862.

The following is a translation of Chevrolat's original description:

Broad, short, and cupreous; head rounded, convex, green and deeply sulcate in its entire length; antennae black; eyes large, somewhat oblong and luteous; thorax pale cupreous, distinctly punctulate, attenuate anteriorly, straight, at vertex arcuate, within slightly margined and sulcate, posteriorly broader, broadly biarcuate, and truncate in front of scutellum, sides deflexed and rounded, the four angles shortly prominent; scutellum triangular and aeneous; elytra aureous (quadratical in form), parallel, margins reflexed, then toward the apex conjointly angularly and obtusely produced, at middle of the base transversely reflexed, beyond the middle semicircularly elevated, and posteriorly transversely depressed, strongly and almost regularly punctate; body beneath and legs cupreous. Length, 3.5 mm.; width, 2 mm. Cuba, in the central region. Collections of Gundlach and Poey.

Gundlach (1891) records collecting it at Guamacaro, between Matanzas and Cardenas, Cuba.

The species is not represented in the Poey collection in Philadelphia, but there is a single example labeled No. 862 in the Gundlach Museum in Habana, which has not been available for study.

Genus PARADOMORPHUS Waterhouse

Paradomorphus WATERHOUSE, Trans. Ent. Soc. London, 1887, p. 183; Biol. Centr. Amer. Coleopt., vol. 3, pt. 1, 1889, pp. 51-57.—KERREMANS, Wytzman's Gen. Insectorum, fasc. 12, pt. 4, 1903, pp. 263-264.

Head more or less tuberculate, front grooved; epistoma emarginate in front and strongly narrowed by the antennal cavities; antennal cavities large, elliptical, oblique and placed at some distance from the eyes; cheeks armed with a short, acute tooth. Antennae 11-jointed, not received in a groove in prosternum while at rest, moderately long, and serrate from the fourth or fifth joint, the serrate joints armed with terminal poriferous foveae. Eyes rather large, oblong, strongly convex, parallel on the inner margin (sometimes a little more widely separated in front than on occiput). Pronotum more or less uneven; bisinuate in front, with the median lobe rounded; sides more or less sinuate and arcuate; base strongly bisinuate, with a distinct median lobe. Scutellum large, triangular, truncate in front and acuminate behind; surface transversely carinate. Elytra

elongate, lobed at base, apex rounded or acuminate; humeri prominent. Sternal cavity formed by the metasternum, and mesosternum, the former arcuately emarginate in front. Mesosternum divided, the lateral branches short and scarcely visible. Prosternum wide in front, attenuate behind, and the anterior margin with a distinct lobe. Middle coxae not more widely separated than the anterior ones. Posterior coxae short, slightly dilated internally, narrowest at middle, and strongly dilated anteriorly at the lateral margin. Abdomen not distinctly visible from above, first and second segments united. Legs slightly robust; femora fusiform, the anterior and median ones dentate on the inner margin; anterior and median tibiae feebly arcuate, the posterior ones straight; tarsi more or less elongate and compressed, the joints armed with distinct lamellae, first joint of posterior pair as long or longer than the following three joints united; tarsal claws dentate, appendiculate or bifid. Body oblong, elongate, and slightly attenuate posteriorly.

Waterhouse has erected this genus for *Agrilus frontalis* Castelnau and Gory, and allied species, which differ from *Agrilus* in having the basal joint of the posterior tarsi comparatively short, but this seems to be a variable character as intermediate forms exist, and in a large series of species the two genera will run together. Kerremans in his classification of this family has retained *Paradormorphus* as a valid genus for the species having the anterior and middle femora finely dentate on the inner margin.

The species of this genus is widely distributed throughout Mexico, Central America, and the northern part of South America, but so far only one species has been found in the West Indies.

PARADORMOPHUS ALBICOLLIS Waterhouse

Paradormorphus albicollis WATERHOUSE, Trans. Ent. Soc. London, 1887, p. 184.

Elongate, broadly rounded in front, feebly attenuate behind, and only slightly narrower behind than in front, subopaque; head black, with bluish and cupreous reflections; pronotum entirely covered with a dense white tomentose, which conceals the surface sculpture; elytra piceous, cyaneo-aeneous at base, more strongly aeneous at lateral sides near middle, and with strong cyaneous reflections posteriorly; each elytron ornated with cinerous pubescence as follows: Three small irregular spots on the disk, the spots arranged in a straight line between the suture and longitudinal costa, the first rather obsolete just behind the scutellum, a larger one at basal third, and a similar one just behind the middle, there is also a narrow zig-zag fascia at apical third extending from the lateral margin slightly forward, then turning obliquely backward, and finally a little transverse, but not reaching the suture; there is also a broad white tomen-

tose fascia extending from suture to lateral margin and separated from apex by an narrow glabrous area; beneath piceous, with a purplish and aeneous reflection.

Head feebly convex; with four round nodules, two on the occiput and two on the front, the anterior ones strongly cupreous, the front longitudinally grooved from occiput to epistoma; surface sparsely punctate, the punctures rather deep and becoming somewhat confused behind the epistoma, the intervals nearly smooth; epistoma slightly wider than the antennal cavities and broadly arcuately emarginate in front. Antennae extending to about the middle of pronotum; first joint short and feebly arcuate; second feebly clavate, and slightly shorter than the first; third and fourth cylindrical, slightly shorter and more slender than the second, and subequal in length; following joints strongly triangular. Pronotum evenly convex, one and one-third times as wide as long at middle, slightly narrower in front than behind, widest at about middle; sides broadly, arcuately rounded; posterior angles nearly rectangular; anterior margin bisinuate, with a broadly rounded median lobe; base nearly truncate to elytral lobe, then turning obliquely backward, and broadly truncate in front of scutellum. Scutellum finely and densely granulose. Elytra about as wide as pronotum at base; sides feebly expanded behind humeral angles, which are obtusely rounded, feebly sinuate to behind middle, where they are broadly rounded, then obliquely attenuate to the tips, which are separately, broadly rounded, and finely dentate; humeri strongly elevated; surface broadly impressed at base, with an obsolete, irregular costa on each elytron, densely but not very deeply punctate, and strongly transversely rugose, besides the cinereous pubescent designs, the surface is also sparsely clothed with inconspicuous black hairs. Abdomen strongly convex, sparsely and finely punctate, the punctures shallow and connected transversely by shallow, sinuate striae, the striae and punctures much coarser at sides of basal segment and from each puncture arises a short recumbent hair, and with a conspicuous white tomentose spot on the sides of the third and fifth segments; intervals finely, obsoletely granulose; last segment broadly rounded at apex. Prosternum feebly, transversely rugose, and densely granulose; prosternal lobe broad, with the anterior margin broadly, arcuately emarginate, and broadly rounded on each side of the emargination; prosternal process nearly flat, feebly attenuate posteriorly, and broadly rounded at apex. Tarsal claws with a broad, obtuse tooth at base.

Length, 8.5 mm.; width, 2.3 mm.

This species was described from Jamaica by Waterhouse and is slightly larger ($9\frac{1}{2}$ mm.) than the one examined by the writer. The above description was made from a specimen kindly loaned by the British Museum and simply labeled "Jamaica."

Genus *AGRILUS* Curtis

Agrilus CURTIS, British Entomology, vol. 2, 1825, No. 67.—STEPHENS, Illustr. British Ent., vol. 3, 1830, pp. 239-241, pl. 19, fig. 2.—ESCHSCHOLTZ, Zool. Atlas, vol. 1, 1829, p. 9 (reprint, p. 8).—SOLIER, Ann. Soc. Ent. France, ser. 1, vol. 2, 1833, pp. 300-303, pl. 12, fig. 24.—CASTELNAU and GOBY, Mon. Bupr., vol. 2, 1838, pp. 1-70, pls. 1-15.—LACORDAIRE, Gen. Col., vol. 4, 1857, pp. 83-84.—HORN, Trans. Amer. Ent. Soc., vol. 18, 1891, pp. 277-336, pl. 8.—KERREMANS, Wytzman's Gen. Insectorum, fasc. 12, pt. 4, 1903, pp. 266-292.

Head vertical, and quite variable, grooved, flat, tuberculate or simply convex behind; epistoma emarginate in front and narrowed by the antennal cavities, cheeks unarmed or with an obtuse tooth on each side; antennal cavities rather large, oblique and prolonged into a groove in front and situated at some distance from the eyes. Antennae variable, often short, and dentate from the fourth or fifth joint, and not inserted in a groove in the prosternum while in repose; first joint rather elongate and robust; second, third, and sometimes the fourth short and feebly clavate; the following joints triangular, dentate on the inner side, and armed with a terminal poriferous fovea. Eyes large, oval, parallel on the inner margin (sometimes a little more widely separated in front than on occiput). Pronotum wider than long, rather convex, broadly emarginate or bisinuate in front; sides more or less arcuate, with two distinct margins, the inner one abbreviated and joined to the outer one posteriorly; base bisinuate, with a broad median lobe, more or less truncate, rounded or emarginate in front of scutellum; surface with or without impressions, and sometimes with a distinct lateral carina near posterior angles. Scutellum broad, acute posteriorly, and sometimes transversely carinate. Elytra elongate, sinuate at base, with or without longitudinal costae; humeri prominent; sides sinuate, and often not covering the sides of the abdomen; apex very variable, sometimes expanded, acute, broadly rounded, or strongly dentate. Sternal cavity formed by the metasternum and mesosternum, the former arcuately emarginate in front. Mesosternum divided, the lateral branches very short. Prosternum wide, and more or less lobed in front; anterior margin truncate, rounded or emarginate; prosternal process broad, with the apex acute, truncate, rounded or expanded. Middle coxae not more widely separated than the anterior ones; posterior coxae short, slightly dilated internally, narrowest at middle, and strongly dilated anteriorly at the lateral margin. Abdomen sometimes visible from above. Legs slender; femora fusiform, not dentate on inner margin, and frequently more strongly swollen in the male than female; tibiae slender and subcylindrical, the anterior ones sometimes ciliate; tarsi long and slender, and the joints armed with distinct lamellae, first joint of posterior pair as long or longer than

the following three joints united; tarsal claws bifid or dentate. Body elongate, feebly convex, broadly rounded in front, and acuminate behind.

This is a very large genus containing over 1,000 described species which are distributed throughout the entire world, with the exception of the extreme northern parts. The species of this genus seem to be rare in the West Indies, as only two have been described from that region, and the specimens are extremely rare in collections.

AGRILUS DOMINICANUS Thomson

Agrilus dominicanus THOMSON, *Typi Buprestidarum*, 1878, pp. 88-89.

Elongate, rather robust, broadly rounded in front, strongly attenuate behind, and distinctly wider in front than behind, olivaceous-green, with cupreous and purplish reflections in certain lights, the cupreous tinge more pronounced on the head and pronotum; beneath aeneous, with a strong purplish tinge.

Head broadly but not very deeply concave, the concavity deeper and narrower on the vertex, becoming broader on the front and extending to the epistoma and transversely to the margin of the eyes, the margins parallel on the front and strongly constricted on the vertex; surface coarsely, irregularly rugose, becoming coarsely punctate on the occiput, with a narrow smooth carina along the margin of the eyes, rather densely clothed with moderately long, wide, recumbent fulvous hairs, having a tendency of forming denser spots on the front; intervals finely and densely granulose; epistoma wider than long, about two times as wide as the antennal cavities, separated from the front by a transverse arcuate carina, deeply and broadly arcuately emarginate in front, with the surface finely granulose; eyes feebly reniform, moderately convex, and two times as long as wide. Antennae extending to about the middle of pronotum, and serrate from the fourth joint. Pronotum rather evenly convex, one and one-third times as wide as long, about equal in width at base and apex, slightly narrower at basal fifth; sides nearly parallel, with a feeble sinuation near the base, and not explanate; lateral marginal edge sinuate when viewed from the side, and the two margins uniting near basal third; anterior margin arcuately emarginate, with a broadly rounded median lobe; base truncate to elytral lobe, then abruptly emarginate and turning obliquely backward to the scutellum, in front of which it is broadly truncate; posterior angles rectangular, with a rather broad, strongly sinuate carina extending to the apical angles; surface with a broad, moderately deep longitudinal median impression extending from the anterior margin to scutellum, and on the inner side of the lateral carina, a very sinuate impression extending from base to the anterior margin, the surface is also coarsely, transversely, and irregularly strigose; intervals finely and

punctures becoming closer toward the sides, and sparsely clothed with a few inconspicuous fulvous hairs in the impressions. Scutellum very broad, with a sharply defined transverse carina, and the surface rather coarsely and densely granulose. Elytra slightly wider than pronotum at base, nearly parallel to basal fifth, feebly sinuate to behind middle, where they are broadly emarginate, then obliquely attenuate to the tips, which are separately broadly rounded, and strongly dentate, the teeth well separated; sides of abdomen narrowly visible from above; each elytron feebly flattened along sutural margin, rather broadly, deeply impressed at base, and with a distinct sinuate and broadly rounded costa extending from the humeri to apex; humeri moderately elevated; surface densely, irregularly, but not very deeply punctate, somewhat rugose at the sides and basal region, and very sparsely clothed with short, inconspicuous fulvous hairs. Abdomen beneath strongly convex, rather densely punctate, the punctures rather shallow and widely separated at the middle, but becoming coarser and somewhat rugose at the sides; rather densely clothed with short, recumbent, cinereous and fulvous hairs, the hairs long and erect at the apex; intervals finely and densely granulose; first segment convex, not impressed nor more pubescent than rest of abdomen; last segment broadly rounded at apex; vertical portions of segments only sparsely pubescent; pygidium not carinate. Prosternum coarsely and rather densely punctate, sparsely clothed with recumbent cinereous hairs, and the intervals finely granulose; prosternal lobe long, declivous and broadly arcuately rounded in front; prosternal process broad, flat, strongly expanded behind coxal cavities, then obliquely attenuate to the apex, which is rather broadly rounded. Posterior tarsi three-fourths as long as the tibiae; first joint as long as the following three joints united; anterior and middle tibiae slightly arcuate, with a feeble mucro at the inner apex, the posterior pair simple; tarsal claws divergent, with a small tooth at base, which is not turned inward.

Length, 11.5 mm.; width, 3 mm.

This species was described in a short description by Thomson from Santo Domingo and seems to be rare in collections. The only specimen examined by the writer which agrees very well with Thomson's description for this species, and from which the above description was made, is in the collection of the American Museum of Natural History at New York. This specimen was collected at Rio Seco, San Carlos Estate, Guantanamo, Cuba, on June 16, 1916, by Chas. T. Ramsden. There is a single example of this species in the British Museum which has not been examined by the writer.

The species is closely allied to *macer* LeConte, from the United States, but differs from it in having the pronotum longitudinally

impressed from base to anterior margin, disk more finely rugose and granulose, the lateral carina extending to the apical angles, and the prosternal process strongly expanded behind the coxal cavities.

AGRILUS DENTICORNIS Chevrolat

Agrilus denticornis CHEVROLAT, Ann. Soc. Ent. France, ser. 4, vol. 7, 1867, p. 536 (separates p. 162).—GUNDLACH, Contribucion à la Entom. Cuba, vol. 3, pt. 5, 1891, p. 170, No. 959.

The following is a translation of Chevrolat's original description:

Form of *Agrilus geminata* Say, linear, granulose and dark violaceous; head densely punctate, vertex truncate, moderately convex and bronzy-green; frontal sulcus transversely impressed posteriorly, antennae attaining the base of thorax, slender and black, joints 5 to 10 angulated (5 to 8 triangular); thorax just as wide as long, in front straight, disk arcuate, base exteriorly strongly sinuate, at sides arcuately dilated, with the margins deplanate, above deeply fossulate, disk longitudinally convex and densely transversely granulose; scutellum transversely reflexed; elytra granulose, parallel, separately rounded, apex denticulate, base impressed, at humeri reflexed; wings violaceous; legs slender and black; body beneath bright cupreous, densely and lightly punctate. Length, 4.5 mm.; width, 1 mm. Cuba, from central part of the island. Collections of Gundlach and Poey.

This small species rather approaches by its form to our slender species from Europe.

Gundlach (1891) records collecting in the Cienago de Zapata, Cuba. The species is not represented in the Poey collection in Philadelphia, but there is a single example labeled No. 959 in the Gundlach Museum in Habana, which has not been available for study.

Genus MICRASTA Kerremans

Micrasta KERREMANS, Ann. Soc. Ent. Belg., vol. 37, 1893, p. 115; Wytzman's Gen. Insectorum, fasc. 12, pt. 4, 1903, pp. 333-334.

Head feebly convex, with a feeble longitudinal groove; epistoma rather elongate and feebly emarginate in front; antennal cavities small, rounded and situated close to the inner margin of the eyes. Antennae short, glabrous, and dentate from the fourth joint; first and second joints thick, the first slightly longer than second; third small; the following joints triangular, (except sometimes the apical joint), dentate on the inner side, and armed with a terminal poriferous fovea. Eyes moderately large, oval, feebly projecting, and parallel on the inner margin. Pronotum wider than long, strongly convex; anterior margin arcuately emarginate; sides arcuately rounded; base transversely truncate. Scutellum very small and subtriangular. Elytra very convex, truncate, and transversely impressed at base; sides parallel in front and broadly rounded behind. Sternal cavity formed entirely by the metasternum, the mesosternum

invisible. Metasternum broadly truncate in front. Prosternum wide and flat; anterior margin truncate; prosternal process rectangular and truncate at apex. Middle coxae not more widely separated than the anterior ones, the posterior pair nearly rectangular, feebly dilated internally and externally. Legs feebly robust and not contractile; femora feebly swollen at middle; tibiae slender, straight, and subcylindrical; tarsi very short; tarsal claws broadly toothed at base. Body oblong, subcylindrical, and equally rounded in front and behind.

This genus was erected by Kerremans (1893) for a number of species from Brazil. Obenberger (1917) described two species from Guadeloupe, neither of which has been examined by the writer.

MICRASTA GYLEKI Obenberger

Micrasta gyleki OBEENBERGER, Entomol. Blätter, vol. 13, 1917, p. 90.

The following is a translation of Obenberger's original description:

Habitat: Guadeloupe.

Length: 2-2.7 mm.

Beautiful golden-bronzy color. Head convex, the surface shagreened, moderately, strongly, sparsely, somewhat finely striate, uniformly punctate. Middle of front with a small, round impression. Eyes situated in the same curve with the front. Antennae long, filiform, black, and extending beyond the base of prothorax.

The proportional length of the single joints:

I.=3; wide, conical, about two times as long as the width at apex.

II.=2; like I, apical part broad, nearly spherical.

III.=1; very short, about two times as slender as II, and as long as wide.

IV.=3; long, triangular, about two times as long as wide.

V.=2½; as wide as the IV.

VI.=2; as wide as the IV.

VII.=Same as VI.

VIII.=Same as VI.

IX.=1¾; long, fusiform.

X.=Same as IX.

XI.=2; long, acuminate.

The prothorax one and one-half times as wide as long at the middle; anterior margin feebly arcuately emarginate; sides expanded at apical third, anteriorly strongly rounded, and posteriorly very feebly arcuately narrowed; posterior angles acutely rectangular; laterally with a small, very sharp, acute, emarginate, marginal line; when viewed laterally this line is entire and straight; under this line there is a submarginal line, which is somewhat obliquely placed, inclined toward the hind angles and converging with the marginal line. The entire upper side of the prothorax is shagreened, sparsely, somewhat finely striate, moderately strongly punctured; some of the punctures are finely transversely confluent with each other. Base almost truncate, the posterior angles slightly produced outward. Scutellum

somewhat longer than wide, triangular, and shagreened. Elytra wide, moderately, strongly, obliquely convex, parallel to apical fourth, then broadly conjointly rounded, two times as long as wide, strongly shining and not shagreened, everywhere (nearly as strongly as on the prothorax) simply punctate. Legs bronzy, and the tarsi dark brown.

This magnificent, charming little species, the first species of this genus from the Antilles, I have received from my highly honored friend and fellow traveler, Mr. Gylek, president of the Wiener Coleopt. Society. I beg leave to name this pretty, new species after my friend, who has always offered assistance in my studies with his entomological material.

MICRASTA PYGMAEOLA Obenberger

Micrasta pygmaeola OBNBERGER, Entomol. Blätter, vol. 13, 1917, p. 91.

The following is a translation of Obenberger's original description:

Habit: Guadeloupe.

Length: 2 mm.

Head and prothorax blue, elytra of a golden-bronzy color, antennae and femora blackish, the tibiae and tarsi yellow.

Head with a dimple-like depression in the middle, convex, smooth, shining, and not shagreened, everywhere sparsely, moderately, strongly, and simply punctate. Antennae long, reaching almost to the base of prothorax; each joint, beginning at the third, is serrate and expanded. Prothorax one and one-third times as wide as long, convex, and in front and at base evenly truncate; at the middle the sides are expanded, from there (at the front somewhat stronger than at the base) anteriorly and posteriorly arcuately narrowed. Above convex, shining, not shagreened, simply, moderately, densely, but not too strongly punctate, similar to that on the head. Elytra somewhat more than two times as long as wide, parallel, shining, densely, moderately, strongly, simply punctate, everywhere with feebly distinct, very short, whitish hairs (this pubescence not very distinct, and only visible with a very strong lens). Elytra parallel to the apical third, then broadly rounded to the tips, which are conjointly rounded. The dorsal part of the abdomen which is covered by the elytra is dark bronzy-green, otherwise the part is yellow.

This pretty little species is separated from *gyleki* by the color, and the upper side not shagreened, the color of the tarsi, the different form of the prothorax, etc.

Genus MASTOGENIUS Solier

Mastogenius SOLIER, Gay's Hist. Nat. Chile, Zool., vol. 4, 1851, pp. 507-508.—

LACORDAIRE, Gen. Col., vol. 4, 1857, p. 85.—KERREMANS, Wytzman's Gen. Insectorum, fasc. 12, pt. 4, 1903, pp. 332-333.

Haplostethus LECONTE, Trans. Amer. Philos. Soc., new ser., vol. 11, 1859, pp. 253-254.

Head regularly convex, with or without a feeble longitudinal groove; epistoma moderately wide between the antennal cavities and

arcuately emarginate in front; antennal cavities large, triangular, and extending to the inner margin of the eyes. Antennae rather long, and dentate from the fourth joint; first and second joints thick, the first slightly longer than the second, which is globular; third elongate and more slender than the second; the following joints elongate, triangular, wider in front, dentate on the inner side, and armed with a terminal poriferous fovea. Eyes rather large, oval, partially covered by the pronotum, a little oblique, and slightly closer together on the occiput than at the bottom of front. Pronotum wider than long, convex; anterior margin arcuately emarginate; sides arcuately rounded, with a lateral carina parallel to the anterior margin, which is not visible from above; base transversely truncate. Scutellum small and feebly triangular. Elytra convex, truncate, and transversely impressed at base; sides nearly parallel in front, and broadly rounded behind. Sternal cavity formed entirely by the metasternum, the mesosternum invisible. Metasternum broad and nearly truncate in front. Prosternum wide, convex at middle; anterior margin truncate or arcuately emarginate; prosternal process rectangular and truncate at apex. Middle coxae not more widely separated than the anterior ones, the posterior pair nearly contiguous, and the sides parallel and scarcely dilated internally. Legs only feebly robust and not contractile; femora slightly swollen at middle; tibiae slender and cylindrical; tarsi very short; tarsal claws broadly toothed at base. Body oblong, subcylindrical, and equally rounded in front and behind.

This genus contains a small number of species which are distributed from the United States to South America, and so far only one has been recorded from the West Indies.

MASTOGENIUS UNIFORMIS Waterhouse

Mastogenius uniformis WATERHOUSE, Ann. and Mag. Nat. Hist., ser. 6, vol. 18, 1896, pp. 105-106.

The following is a copy of Waterhouse's original description:

Aureo-aeneous, convexus, sat nitidus, subtiliter punctulatus; capite convexa, fronte vix canaliculata; thorace lateribus leviter arcuatis, basi truncato; elytris subparallelis, apice arcuatim attenuatis; antennis pedibusque fere nigris, tarsis brevibus flavescens.

Long. 2 mill.

Hab. Mount Gay Estate (Leeward side), Grenada, W. I. (H. H. Smith). I do not know of any Buprestid quite of this form; it reminds me somewhat of *Aurigena* in its outline, but has the thorax rather broader and more convex. The surface, when examined with the microscope, has somewhat the appearance of leather. Head convex, finely and not very closely punctured, with a slight median impressed line; below with a groove bordering the eye for the reception of the basal joints of the antennae, the groove continued on the sternum, but becoming gradually narrower and terminating about halfway between the front margin and the coxae. Antennae as long as the head and thorax together, the two basal joints moderately stout, the third joint rather slender, the following joints triangular, the terminal joint elliptical. Thorax transverse, convex, almost rectilinear at the base, not much narrowed at the

base, arcuately rounded at the sides; finely and not very closely punctured. Scutellum rather small, curvilinear. Elytra at base not quite as broad as the broadest part of the thorax, about three times as long as the thorax, with a very slight transverse impression at the base, without other impressions; the punctuation irregular, fine but distinct, the punctures moderately separated from each other. Underside sculptured as above. Front and intermediate coxae rather widely separated. The prosternal process broad, flat, parallel, truncate posteriorly, and fitting close to the metasternum, the process bordered on each side by a distinct but fine line, the lines diverging slightly as they approach the anterior margin of the prosternum; with a few large shallow punctures. Abdomen with no division between the first and second segments, together about half the length of the abdomen, the third and fourth short, fifth semicircular. Tarsi short, the first joint scarcely longer than the second. Claws dilated at the base, the dilation appearing in some positions like a large triangular tooth.

From the foregoing description it will be seen that this species differs from the typical species of *Mastogenius* in having a groove in the sternum for a portion of the antennae, and in having the basal joint of the tarsi short, etc.

My first impression was that it must be made the type of a new genus; but an examination of some allied forms has convinced me that this would be premature.

The type of this species is in the British Museum, and has not been examined by the writer.

CORRECTIONS

In my paper on The Leaf and Twig Mining Buprestid Beetles of Mexico and Central America²⁷ the following errors have occurred:

Page 6: The paragraph beginning with line 29 should be placed under the genus *Pachyschelus*, just before the key to the species on page 7.

Page 73: The first six lines in the key to the species of *Leiopleura* should read as follows:

5. Narrow species, more than two times as long as wide; pronotum with a deep depression near posterior angles, where the surface is obsoletely rugose, the sides distinctly margined..... *minuta* Kerremans.
Broader species, not two times as long as wide; pronotum without a deep depression near posterior angles, where the surface is strongly rugose, the sides obsoletely margined..... *nigra* Waterhouse

²⁷Proc. U. S. Nat. Mus., vol. 62, 1922, Art. 8.

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STUDIES ON LARVAE OF CRABS OF THE FAMILY GRAPSIDAE.

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INTRODUCTION.

The material on which the original descriptions and drawings of this paper are based was collected at Beaufort, N. C., during the summers from 1916 to 1922. The egg-laden females were kept in crystallization dishes until their eggs hatched. The young zoeas were then drawn with the aid of a camera lucida. They were kept under observation until they died within a few days. The writer acknowledges his indebtedness to Dr. Waldo L. Schmitt, of the United States National Museum, for his generous help in preparing the material for publication.

THE GRAPSID ZOEAE.

The only zoeas of this family that have been described thus far are remarkably uniform in structure.¹ A zoea of *Cyclograpsus* is mentioned by Bate and Power but neither a description nor a figure is given. A young form is said to have been described by Cavolini but the writer has not been able to consult the paper. The zoeas referred to below are those of *Sesarma*, *Planes*, and *Pachygrapsus*. These are characterised by the absence of the lateral spines of the carapace and the equal lengths of the antennae and frontal spine. They are very similar to the zoeas of the Ocypodidae from which they may be distinguished by the comparative length of the antennae. These are only two thirds as long as the rostral spine in the Ocypodidae.

¹ Cano describes zoeas that are assigned to *Plagusia*, to *Euchirograpsus*, and to *Planes* (*Nautilograpsus*). He did not secure those of *Plagusia* or *Euchirograpsus* directly from the female and is somewhat doubtful in assigning them. His figures of *Planes* differ so entirely from those of the writer that the two can not be referred to the same species—probably not to the same genus. As the writer secured his zoeas by hatching from a single female in solitary confinement there can be no doubt that they are in truth the larvae of *Planes*.

The larvae described by Cano for *Plagusia*, *Euchirograpsus*, and *Planes* resemble each other closely in the structure of the telson. Those of *Euchirograpsus* and *Planes* possess well developed lateral spines on the carapace. The larva assigned to *Plagusia* does not possess carapace spines. It is highly probable that these larvae should be assigned to another family altogether.

KEY TO KNOWN ZOEAS.

- a.*¹ Exopodite of antenna a well-formed segment with several hairs.
*b.*¹ Basipodites of both first and second maxillipeds with pigment spots..... *Sesarma cinerea*.
*b.*² Basipodite of second maxilliped only with pigment spot,..... *Sesarma reticulata*.
*a.*² Exopodite of antenna reduced to a tubercle with a single hair.
*b.*² Eyes large..... *Planes minutus*.
*b.*² Eyes small..... *Pachygrapsus marmoratus*.

PIGMENTATION.

The color of the pigment in each case is black in the contracted condition and varies from black to reddish-brown to yellow in expansion.

	<i>P. minutus</i> .	<i>S. cinerea</i> .	<i>S. reticulata</i> .
Anterior rostral.....	+	+	+
Interorbital.....	+	+	+
Supracardiac.....	-----	-----	+
Subcardiac.....	+	-----	-----
Lateral to stomach.....	+	-----	-----
Lateral to first abdominal segment.....	+	-----	-----
Postero-ventral lobe.....	+	-----	+
Labrum.....	+	+	+
Mandible.....	+	+	+
Antenna.....	-----	+	-----
Maxillule.....	-----	+	-----
Basipodite first maxilliped.....	+	+	-----
Basipodite second maxilliped.....	+	+	+
Dorso-lateral first abdominal segment.....	+	-----	+
Ventral first abdominal segment.....	+	-----	-----
Ventro-lateral second abdominal segment.....	+	+	+
Ventro-lateral third abdominal segment.....	+	+	+
Ventro-lateral fourth abdominal segment.....	+	+	+
Ventro-lateral fifth abdominal segment.....	+	+	+
Telson.....	+	-----	-----

METAMORPHOSIS.

The metamorphosis of the family seems to follow the usual brachyuran formula. There are at least three zoeal stages and there are probably five. Two megalops stages are described. Cano has described the development of *Pachygrapsus marmoratus* up to the early crab stage.

PACHYGRAPSUS MARMORATUS (Fabricius).

The development of this form has been described by Cano (1891). He gives a series of figures that show more details than the description. Cano did not secure his stages by observed molting of known stages and seems to have missed some of the zoeal stages entirely. The zoea seems to resemble that of *Planes* very closely indeed and it is difficult to distinguish them certainly from the description published. Cano did not describe the pigmentation and thus one useful

method of distinguishing closely related forms is not now available. The eyes of *Planes* are relatively very large and its pigmentation unusually heavy. The eyes of *Pachygrapsus* are much smaller.

FIRST ZOEAE (fig. 21).

Cephalothorax.—The dorsal and rostral spines are short and stout. Both pass outward perpendicularly to the long axis of the body. Cephalic appendages: The antennule (fig. 27) is a single segment and carries sensory hairs and a seta. The antenna (fig. 27) is in the form of a strong spike that carries an extremely minute exopodite. The spike is hairy near its tip. The other cephalic appendages (figs. 33 and 37) have the usual brachyuran form.

Thoracic appendages.—These have the usual brachyuran form. The first and second maxillipeds carry four swimming hairs.

Abdomen.—The telson (fig. 55) is bicornuate and its horns pass backward almost parallel with each other. There are three spines on the median surface of each cornu. The lateral surface is smooth and does not show a spine.

SECOND ZOEAE.

The second zoea is not known. The form described by Cano as the second zoea is doubtless the third stage.

THIRD ZOEAE (fig. 22).

The second zoeal stage represented by Cano is probably the third zoeal stage. Cano shows only four swimming hairs on the maxillipeds, but this probably was due to error. They probably had as many as seven or eight hairs. The fact that the scaphognathite is well developed (fig. 38) indicates that the stage is advanced beyond the second zoeal. A more careful examination of this stage probably would show the anlagen of the endopodites of the antennae and of the abdominal appendages.

FOURTH ZOEAE.

The fourth zoeal stage seems to have been overlooked by Cano.

FIFTH ZOEAE (fig. 23).

The third stage described by Cano shows the condition characteristic of the last zoeal stage. This is the fifth stage in the Xanthidae and Ocypodidae. There are eleven or twelve swimming hairs, the mandible shows a palp, and the thoracic appendages are fully articulated.

Cephalic appendages.—The antennule (fig. 28) shows a base of three segments and, distally, an endopodite of four segments each bearing two or three sensory hairs and an unsegmented smooth exopodite. The coxal segment is enlarged for the statocyst.

The antenna (fig. 28) shows a finger-like bud, the endopodite, the anlage of the future flagellum.

The mandible (fig. 31) bears an unsegmented smooth palp.

The maxillule (fig. 34) shows the solitary epipodital hair on the basipodite. The appendage now reaches its greatest differentiation. Its palp is composed of two segments, and it carries seven or eight long hairs.

The maxilla (fig. 39) also reaches its greatest differentiation. Its palp carries six to nine hairs.

Thoracic appendages.—The first and second maxillipeds show twelve and eleven swimming hairs respectively. The third maxilliped does not have hairs and is rudimentary, but all of its segments are differentiated.

The periopods are rudimentary, although all of their segments are differentiated. The first bears two gills, the second and the third one each.

Abdomen.—The third, fourth, and fifth segments bear short lateral spines on their posterior margins. The sixth segment is separated from the telson. All the segments except the first carry bifurcated appendages. These are smooth as yet.

FIRST MEGALOPS (fig. 24).

Cephalothorax.—The body has the usual shape of a brachyuran megalops. The dorsal spine has disappeared without leaving a trace. The frontal spine is reduced in size but still prominent. The periopods are well developed.

Cephalic appendages.—The antennules and antennae are not described by Cano by word or drawing. The mandibular palp (fig. 32) shows three segments and carries sensory hairs. The maxillule (fig. 35) is considerably altered. Its palp has begun to degenerate. Its joints are lost and it carries a single hair. The maxilla (fig. 39) also has begun to degenerate. Its palp is hairless. The scaphognathite is larger.

Thoracic appendages.—The maxillipeds (figs. 43, 46, and 51) show the usual megalops condition. The exopodite becomes a sense organ and develops a palp terminally. The endopodite is greatly enlarged and with the basal segments becomes an organ of mastication. Gills appear upon the second and third maxillipeds.

The periopods are greatly enlarged and well-formed. They appear elongated and slender and are nearly cylindrical.

Abdomen.—The abdomen is depressed. The appendages are not mentioned by Cano but they probably are typical for the stage.

The telson becomes a flattened plate with a rounded posterior border.

SECOND MEGALOPS (fig. 25).

The second megalops stage differs from the first chiefly in the shape of the cephalothorax. The carapace is shorter, broader, and more depressed. The frontal spine has disappeared and its position is marked by a furrow.

Cephalic appendages.—The antennule (fig. 29) shows three enlarged basal segments bearing distally the two palps. The endopodite is composed of five segments each bearing sensory hairs. The exopodite has two segments, the distal bearing hairs. The antenna (fig. 29) is a single flagellum. The proximal three segments are enlarged. The mandible, the maxillule (fig. 36a), and the maxilla are (fig. 41) scarcely changed from the first megalops condition.

Thoracic appendages.—(Figs. 44, 47, 49, 50, and 52.) These show only a few minor changes.

Abdomen.—The abdomen is appreciably broadened and flattened. The appendages (fig. 54) are fully developed as swimming organs.

FIRST CRAB STAGE.

In the first crab stage the cephalothorax has the definite quadrate shape of the family. It is greatly depressed. The abdomen is permanently flexed under the sternum. The pereopods are large and flattened.

Cephalic appendages (figs. 30, 36b, and 42).—The exopodite of the antennule has disappeared and this appendage as well as the remaining cephalic appendages is in the adult condition.

Thoracic appendages (figs. 45, 48, and 53).—These are now in the adult condition.

Abdomen.—The megalops abdominal appendages are present but are small and shriveled. The adult appendages have not yet developed.

PLANES MINUTUS (Linnaeus).

The zoea of this species was known to Thompson who writes that it so closely resembles the zoea of *Eriphia caribbea* as not to merit a separate description or figure. The zoea probably does not occur regularly in the tow at Beaufort. The ovigerous female from which were hatched the specimens here described was brought into the harbor by an unusual combination of wind and tides on June 22, 1920.

The zoea is notable for its minute size (0.9 mm. long and 0.3 mm. dorso-ventrally through cephalothorax), its disproportionately large eyes and long maxillipeds, and its heavy pigmentation.

FIRST ZOEA (figs. 1 and 2).

Cephalothorax.—The dorsal and rostral spines only are present and each is slender and rather short (0.2 mm.). The pigment spots

cover the carapace with a confluent net of black lines when expanded. The eyes are strikingly large and well formed.

Cephalic appendages.—The antennules (fig. 3), mandibles (fig. 5), maxillules (fig. 6), and maxillae (fig. 7) have the typical brachyuran structure. The antennae (fig. 4) are as long as the rostral spine. They appear as stout spikes carrying very inconspicuous exopodites. The distal portion of the spike is covered with minute hairs. The exopodite appears as a tubercle carrying a single hair.

Thoracic appendages.—The first and second maxillipeds (figs. 8 and 9) have the usual structure, with four swimming hairs. They are both very large for such a small zoea. The endopodite of the second maxilliped has three segments.

Abdomen.—The joints of the abdomen are unusually well formed. There are pronounced lateral tubercles on segments 2, 3, and 4 (fig. 10). The telson is typically bicornuate.

Genus SESARMA Say.

The zoeas of the two species of *Sesarma* here described are so similar morphologically that they can be distinguished by their pigmentation only and by a slight difference in size. That of *S. reticulata* (Say) (figs. 13 and 14) is smaller and somewhat more heavily pigmented. It is most readily distinguished by the presence of a pigment spot behind the dorsal spine and the absence of pigment on the first maxilliped. The zoea is 1.3 mm. long and .4 mm. dorso-ventrally through the cephalothorax.

The first zoea of *S. cinerea* (Bosc) is noticeably robust and its olive-green eyes are conspicuous objects. Its length is 1.6 mm. and its carapace depth 0.6 mm. It is best distinguished by the pigmentation of both maxillipeds.

FIRST ZOEA OF SESARMA.

Cephalothorax.—The dorsal and rostral spines are relatively slender and short and the dorsal curves pronouncedly posteriorly. The eyes are perhaps a little smaller than they are usually.

Cephalic appendages.—Only the antennae are not typically brachyuran. They show a well-developed exopodite (fig. 16). The exopodite is a cylindrical segment about one-third as long as the spine. It bears two or three hairs.

Thoracic appendages.—These do not show any unusual feature.

Abdomen.—The lateral border of each segment is produced somewhat posteriorly as a deltoid tooth. The telson is typically bicornuate.

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EXPLANATION OF PLATES.

PLATE 1.

- FIG. 1. First zoea of *Planes minutus*, lateral view.
2. Same, frontal view.
3. Same, antennule.
4. Same, antenna.
5. Same, mandible.
6. Same, maxillule.
7. Same, maxilla.
8. Same, first maxilliped.
9. Same, second maxilliped.
10. Same, abdomen, ventral view.
11. First zoea, *Sesarma cinerea*, lateral view.
12. Same, frontal view.

PLATE 2.

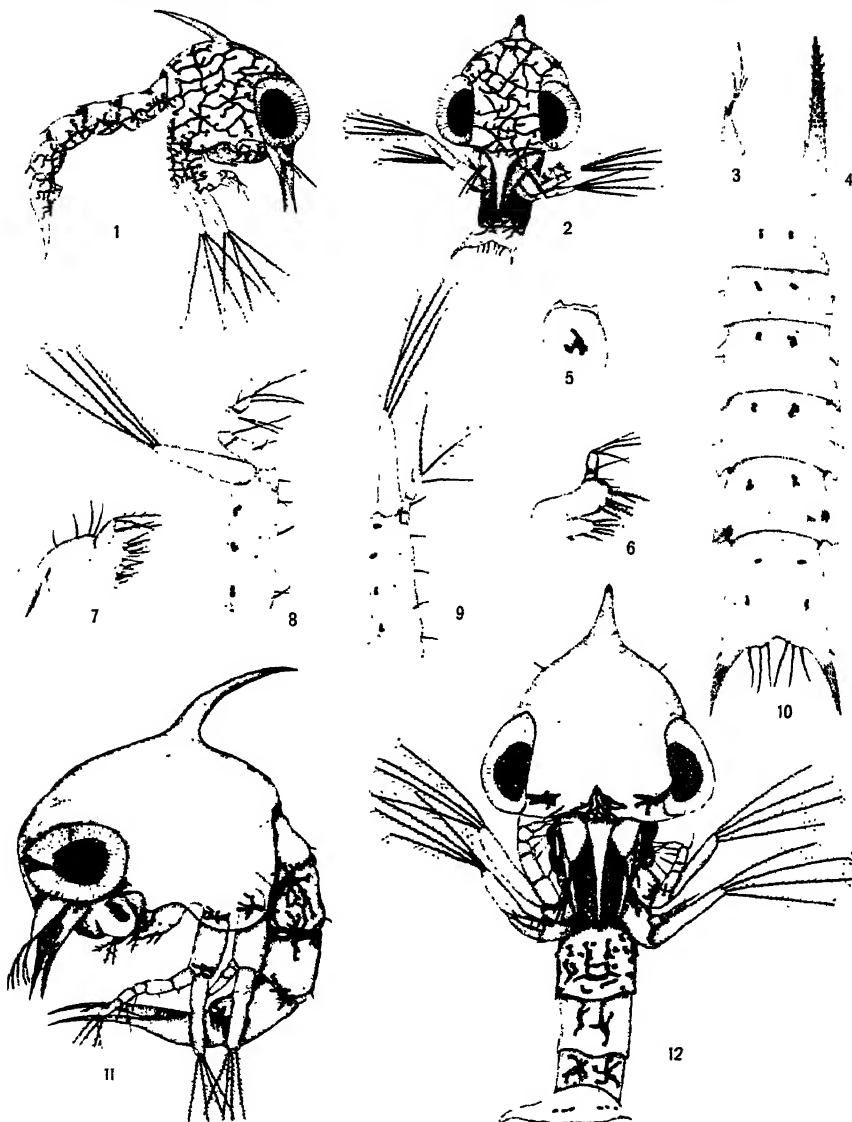
- FIG. 13. First zoea of *Sesarma reticulata*, lateral view.
14. Same, frontal view.
15. Same, antennule.
16. Same, antenna.
17. Same, maxillule.
18. Same, maxilla.
19. Same, second maxilliped.
20. Same, telson.

PLATE 3.

Pachygrapsus marmoratus.

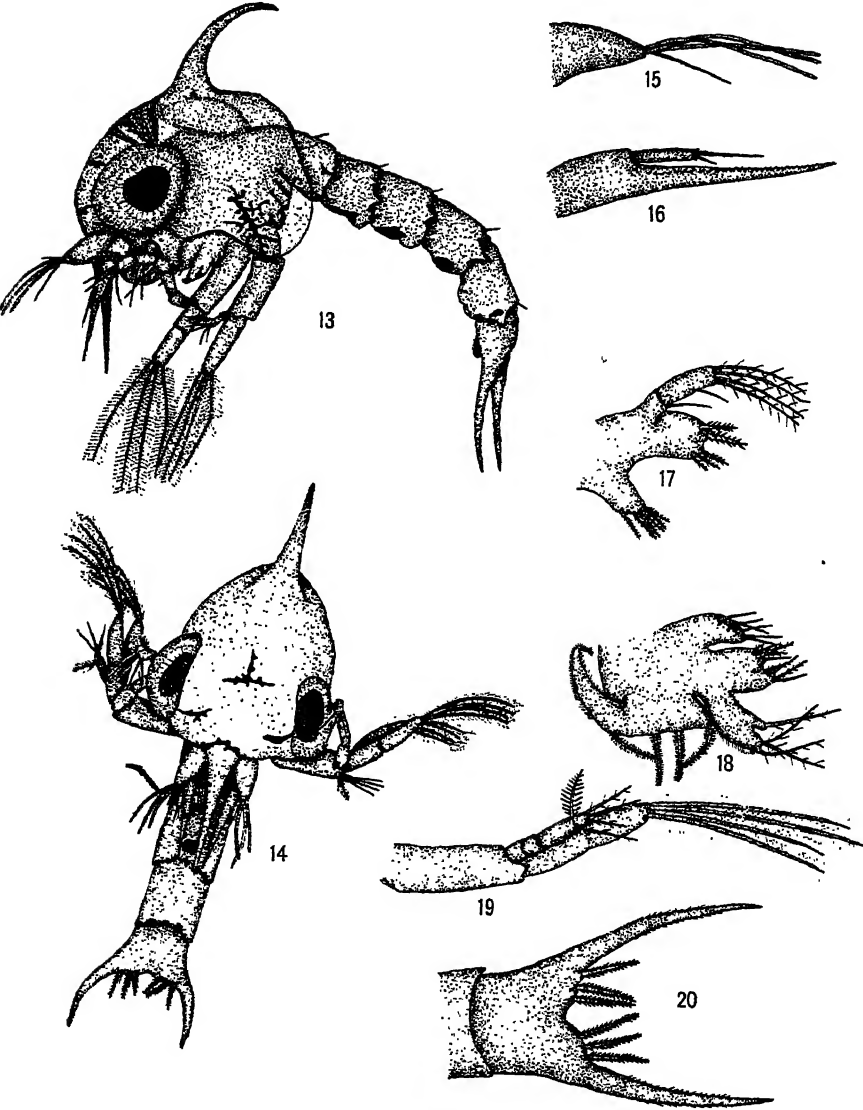
- FIG. 21. First zoea, lateral view.
22. Third zoea, lateral view.
23. Fifth zoea, lateral view.
24. First megalops, dorsal view.
25. Second megalops, dorsal view.
26. First crab, dorsal view.
27. Antennule and antenna, first zoea.
28. Antennule and antenna, fifth zoea.
29. Antennule and antenna, second megalops.

- FIG. 30. Antennule and antenna, first crab.
31. Mandible, fifth zoea.
 32. Mandible, first megalops.
 33. Maxillule, first zoea.
 34. Maxillule, fifth zoea.
 35. Maxillule, first megalops.
 - 36a. Maxillule, second megalops.
 - 36b. Maxillule, first crab.
 37. Maxilla, first zoea.
 38. Maxilla, third zoea.
 39. Maxilla, fifth zoea.
 40. Maxilla, first megalops.
 41. Maxilla, second megalops.
 42. Maxilla, first crab.
 43. First maxilliped, first megalops.
 44. First maxilliped, second megalops.
 45. First maxilliped, first crab.
 46. Second maxilliped, first megalops.
 47. Second maxilliped, second megalops.
 48. Second maxilliped, first crab.
 49. Cheliped, second megalops.
 50. Second periopod, second megalops.
 51. Third maxilliped, first megalops.
 52. Third maxilliped, second megalops.
 53. Third maxilliped, first crab.
 54. Pleopod, second megalops.
 55. Telson, first zoea.
 56. Telson, second megalops.



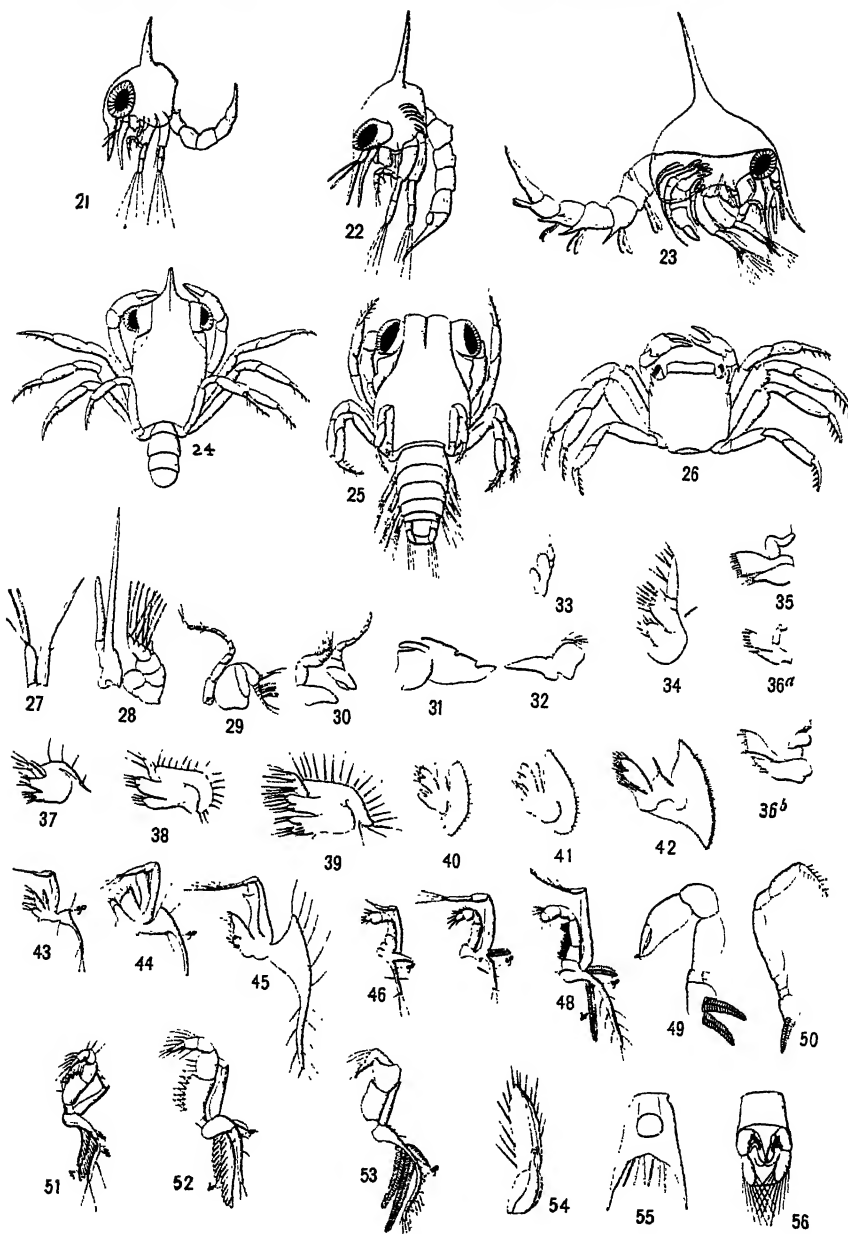
LARVAE OF *PLANES MINUTUS* (1-10) AND *SESARMA CINEREA* (11 AND 12)

FOR EXPLANATION OF PLATE SEE PAGE 7



LARVAE OF SESARMA RETICULATA

FOR EXPLANATION OF PLATE SEE PAGE 7



LARVAE OF *PACHYGRAPSUS MARMORATUS*

FOR EXPLANATION OF PLATE SEE PAGES 7 AND 8

AMASTRIDIDIUM, A NEGLECTED GENUS OF SNAKES.¹

By E. R. DUNN

Of the Department of Zoology, Smith College, Northampton, Massachusetts.

I have recently had the pleasure of examining several specimens of a small snake from Central America, which is undoubtedly the species described by Cope as *Amastridium veliferum*.² In 1886 Cope mentioned the fact that this species possessed hypapophyses on the posterior vertebrae;³ in 1892 he stated that the hemipenis had a divided sulcus;⁴ in 1894 he further described this organ as undivided, with divided sulcus, with well developed spines, and "calyculate not capitate,"⁵ and in 1900 he figured the hemipenis.⁶ Boulenger⁷ quoted the original description at the end of his account of the Colubridae, omitting the genus from his key to the family as of "doubtful position." In 1898 Boettger⁸ redescribed it as *Fleischmannia obscura*. Günther does not mention this snake in the *Biologia Centrali-Americana*. Two specimens collected by Robert I. Matthews at Greytown, Nicaragua, are in the United States National Museum, and a specimen from Cariblanco, Costa Rica, is in the Museum of Comparative Zoölogy.

I have also seen a single specimen in the U. S. National Museum from Chicharro, Chiapas, Mexico, which agrees in detail with the species described by Werner⁹ as *Mimometopon sapperi*.

These two species are unquestionably congeneric and should stand as *Amastridium veliferum* Cope and *Amastridium sapperi* (Werner).

They differ as follows:

Veliferum: Loreal absent, ventrals 121-135, maxillary teeth 12-2, no groove visible under magnification of 80 diameters.

¹ Contributions from the Department of Zoology, Smith College, No. 110.

² Proc. Acad. Nat. Sci. Philadelphia, 1886, p. 370, "Cocuyas de Veraguas," Panama.

³ Proc. Amer. Philos. Soc., vol. 23, 1886, p. 495.

⁴ Amer. Nat., vol. 26, 1892, p. 481.

⁵ Idem, vol. 28, 1894, p. 840.

⁶ Report U. S. Nat. Mus., 1898, pl. 24, fig. 13.

⁷ Cat. Snakes Brit. Mus., ser. 2, vol. 2, 1894, p. 352.

⁸ Kat. Mus. Senckenberg., Rept., vol. 2, p. 69, San José, Costa Rica.

⁹ Abh. Bayer. Akad. Wiss., 1903, vol. 22, pt. 2, p. 349, Guatemala.

Sapperi: Loreal present, ventrals 153-158, maxillary teeth 14, 16-2, a groove visible under magnification of 80 diameters.

The hemipenis, hypapophyses, coloration, and habit of the two species are identical. Both have 17 rows of smooth, pitless, scales. Both have oculars 1-2, temporals 1-2; a divided anal, a single nasal, and the third and fourth upper labials entering the eye. The following list will indicate the further scalation and the provenance of the specimens:

Source.	Sex.	Ventrals.	Caudals.	Labials.	Locality.
Cope, 1866.....	Male.....	127	85	7/9	Cocuyas, Panama.
Boettger, 1898.....	♂.....	123	79	7/	San Jose, Costa Rica.
Mus. Comp. Zool., 15319.....	Female.....	135	+48	7/9	Cariblanco, Costa Rica.
U. S. Nat. Mus., 29216.....	Male.....	121	73	7/8-9	Greytown, Nicaragua.
U. S. Nat. Mus., 29217.....	do.....	123	78	7/8	Do.
Werner, 1903.....	♀.....	158	86	7/	Guatemala.
U. S. Nat. Mus., 46509.....	Male.....	153	+86	7/9	Chicharro, Mexico.

In the Museum of Comparative Zoology No. 15319 the parietal meets the fifth labial on each side. Cope (1866) described his specimen (a male) as with keeled scales in the anal region. This is the case in the two large males I have seen in the United States National Museum (Cat. No. 29216 and Cat. No. 46509), but not in a very small male (Cat. No. 29217) nor in either of the females. Boettger and Werner do not mention this peculiarity.

The color is black, with a white dot on about every fourth scale of row 5. The upper surface of the head is light.

The hemipenis has two very large hooks which occupy the basal third, then increasingly smaller and more numerous hooks passing gradually into calyces which occupy the distal fifth. The sulcus is divided for the distal third.

The relationships of this genus are somewhat to seek. Perhaps examination of various characters in order will set forth more clearly the diverse genera allied.

Hemipenis: Among the snakes whose hemipenes are known *Thamnodynastes* possesses male organs almost exactly like those of *Amastridium*. *Tretanorhinus* and *Hydrocalamus* each have four large basal hooks instead of two, and in each the calyculate area has a free proximal edge—that is, is “capitate.” *Diadophis* has numerous basal hooks.

Dentition: The dentition of *Thamnodynastes*, of *Paraoxyrhopus* and of *Hydrocalamus* is the same as that of *Amastridium*. That of *Diadophis* differs in the absence of a gap in the tooth row anterior to the two enlarged teeth. Many other forms have closely similar dentition.

Vertebrae: *Tretanorhinus* and *Paraoxyrhopus* have hyapophyses on the posterior dorsal vertebrae, and are the only two genera having them which are possible allies of *Amastridium*.

Scalation: *Paraoxyrhopus*, *Tretanorhinus*, and *Hydrocalamus* lack scale pits; *Thamnodynastes* and *Diadophis* have them. My friend, Dr. Frank N. Blanchard, tells me that males of *Diadophis* have the scales of the anal region keeled.

Eye: *Thamnodynastes* has a vertical pupil. The other genera have a round pupil.

To sum up: *Paraoxyrhopus* agrees very closely with *Amastridium* in all its known characters. The hemipenis, however, is unknown.

Thamnodynastes, suggested as a related genus by Werner (1903), differs in having a vertical pupil, in having scale pits, and in lacking hypapophyses.

Hydrocalamus has a different hemipenis, and no hypapophyses.

Tretanorhinus has a different hemipenis, a very different dentition, and different physiognomy.

Diadophis has a different hemipenis, different dentition, scale pits, and different physiognomy.

The combination of characters seen in this genus and in its apparent allies serves to show (a) the uselessness of the groove on the posterior maxillary teeth as a character of importance; (b) the presence of hypapophyses in American "Opisthoglyph" snakes; (c) the presence of hypapophyses in snakes with forked sulcus spermaticus. A modification of the present scheme is evidently necessary. I suggest the following as a working basis for determining the relationships of American Colubrid snakes:

- a¹. Sulcus spermaticus divided.....*Dromicinae*.
- a². Sulcus spermaticus single.
- b¹. Calyces present. Hypapophyses present.....*Sibynophis* ("*Polyodontophis*").
- b². Calyces present. No hypapophyses.....*Colubrinae*.
- b³. No calyces. Hypapophyses present.....*Natricinae*.

KEYS TO FLIES OF THE FAMILIES LONCHAEIDAE,
PALLOPTERIDAE, AND SAPROMYZIDAE OF THE
EASTERN UNITED STATES, WITH A LIST OF THE
SPECIES OF THE DISTRICT OF COLUMBIA REGION.

By J. R. MALLOCH and W. L. McATEE,

Of the United States Biological Survey.

This paper contains a list of the species in the families Lonchaeidae, Pallopteridae, and Sapromyzidae that have been collected in the vicinity of the District of Columbia. To facilitate identification of the species so recorded, synopses of the genera and species are included which embrace all the species known to the authors which have been recorded from the territory east of the Mississippi River, and also all species likely to occur in that territory.

Many authors consider the families dealt with in this paper as subfamilies of Sapromyzidae, but there is very little real similarity between Sapromyzidae and Lonchaeidae. The Pallopteridae appear to be more closely related to the Lonchaeidae than to the Sapromyzidae, but there are some very important points of difference between this family and the other two which are emphasized in the discussion of the family characters.

All three families belong to the acalyptrate section of the Cyclorhapha, having the abdominal spiracles in the membrane between the tergites and the sternites, close to the former. The auxiliary vein is present and complete, vibrissae are absent, and the basal cells of the wings are complete, the posterior one not prolonged at its apical posterior angle, characters which separate these families from most of their allies.

The very well developed frontal lunule of the Lonchaeidae which invades the anterior margin of the interfrontalia more or less triangularly and is generally setulose (fig. 2), the presence of a stigmal and propleural bristle, very small size of preapical tibial bristle, and the complete, though apically indistinct, bisinuate sixth wing vein (fig. 4) separates the family from any other. No family which has the ovipositor very much elongated and sword-shaped, as has this one, has the propleura bare above the bristle and the

frons as described above. Other characters that may be mentioned are: Orbital bristle 1; and dorsocentrals, two pairs. The family is more closely related to Ortalidae than to Sapromyzidae.

The Pallopteridae resemble the Lonchaeidae in having the ovipositor elongate sword-shaped, but the frons is transverse at its anterior margin as in Sapromyzidae, and the frontal lunule is concealed; the propleural bristle is absent or present; stigmal bristle absent, or present but weak; sixth wing vein traceable to margin, straight; preapical dorsal tibial bristle absent; each orbit with one bristle as in Lonchaeidae; propleura bare.

The Sapromyzidae have no stigmal bristle, and in this respect agree with many allied families, but the propleura are bare; the sixth wing vein is shorter than the seventh; the posterior basal cell of wing is very small and is not prolonged at apex; usually one or more pairs of the tibiae have a distinct preapical bristle, and both the mesopleura (except in *Periscelis*) and sternopleura have one or more strong bristles. Each orbit in American genera (except *Periscelis*) with two bristles; the frontal lunule is concealed; the anterior margin of frons transverse; postvertical bristles convergent or cruciate; propleural bristle present. The ovipositor is never sword-shaped.

Our only representative of the Pallopteridae occurs in humid, well-shaded localities; the Sapromyzidae, on the other hand, are rather inclined to sit in the sun and they are sometimes attracted to flowers. The immature stages of these families are practically unknown. The larvae of a number of Lonchaeidae are known, however, and they live in sappy places under bark or in decaying vegetation where they are predaceous; the adults are of more random occurrence than those of the other families here treated but agree with them in being attracted to light.

The number of species in the present list compared to that of the New Jersey State List of Insects¹ is:

Family.	New Jersey.	District of Columbia.
Lonchaeidae.....	2	10
Pallopteridae.....	1	1
Sapromyzidae.....	22	49

Of the 60 species here listed, 19 (indicated in text by asterisks) were originally described from material derived wholly or in part from our region. Thirty-two of the species have been collected on Plummer Island, Md., headquarters of the Washington Biologists' Field Club, and 17 others in adjacent parts of the Potomac River

¹ Ann. Rep. State Mus., (1909) 1910, Diptera by C. W. Johnson.

Valley. These facts of occurrence when not expressed in the detailed records are indicated by the abbreviations P. I. and V. P. I. respectively.

Previously described species, not yet collected, that should be obtainable in our region are: *Steganolausania latipennis* Coquillett, New Jersey to Florida; *Lausaniella opaca* Loew, New Jersey to Florida; and *Sapromyza resinosa* Wiedemann, New York to Florida.

Family LONCHAEIDAE.

Only one genus of this family has hitherto been recognized in North America, but there is every reason to believe that the group *Earomyia* Zetterstedt is entitled to at least subgeneric rank. Three of the species (*aberrans*, *aterrina*, and *nigrociliata*) included in this paper belong to *Earomyia*, having the frontal lunule bare, but they are included in the key to species of *Lonchaea* to facilitate identification and establish relationships.

The genotype of *Lonchaea* is *vaginalis* Fabricius, which has been stated by some European authors to be synonymous with *chorea* Fallén.

The genotype of *Earomyia* is *lonchaeoides* Zetterstedt, which for some obscure reason was renamed *frontata* by Becker in 1895.

The following key includes all species known to the authors to occur in North America. Some other species which have been recorded, we have not seen and do not attempt to include.

Genus LONCHAEA Fallén.

KEY TO SPECIES.

1. Frons in both sexes with large irregular pits or depressions; a strong bristle near anterior margin of cheek..... *vibrissata* Malloch. 2
- Frons impunctate or almost so, not pitted..... 2
2. Several bristly hairs surrounding the stigmatal bristle..... 3
- No hairs surrounding stigmatal bristle..... 11
3. Fringes of calyptrae black or fuscous..... 4
- Fringes of calyptrae white or yellow..... 9
4. Third antennal segment much less than twice as long as its greatest width; frontal lunule bare; ovipositor abnormally wide..... *aterrima* Malloch.
- Third antennal segment over twice as long as wide; frontal lunule with some hairs 5
5. Eyes in both sexes distinctly hairy, in the male conspicuously so; second costal division very long; disk of scutellum hairy..... 6
- Eyes bare or almost so..... 7
6. Pteropleura hairy in center; cheeks with dense short erect fine hairs. *pleuriseta* Malloch.
- Pteropleura bare; cheeks with longer setulose hairs..... *ursina* Malloch.
7. Tarsi entirely black..... *atritarsis* Malloch.
- Tarsi largely yellowish..... 8

8. Orbit with several long fine hairs above the bristle; cheeks, frons, and mesonotum with rather dense erect black hairs; wings whitish or yellowish, infuscated at bases; scutellum with some long erect hairs on disk near apex as well as on the margins; pteropleura usually with one or two long hairs in center..... *hirta* Malloch.

Orbits bare or with a single hair above bristle; cheeks, frons, and mesonotum with more sparse black hairs; scutellum generally bare on disk; pteropleura bare..... *affinis* Malloch.

9. Third antennal segment but little longer than wide; scutellum with four strong bristles and no fine hairs; face of male silvery; ovipositor of female nearly as broad as frons, acutely pointed at apex, the preapical hairs very short; auxiliary vein nearly fused with first at apex.

arkansensis Malloch

Third antennal segment about three times as long as wide; scutellum with some fine hairs on margins as well as the four long bristles; face of male not silvery; female ovipositor slender, very much narrower than frons. 10

10. Glossy upper portion of orbits black; orbital bristle not proximad of anterior ocellus; cheek with dense short stiff hairs; third antennal segment not over three times as long as wide, almost entirely orange red.

ruficornis Malloch.

Glossy upper portion of orbits blue; orbital bristle distinctly proximad of anterior ocellus; cheek with some short hairs and one or two longer bristles; third antennal segment over three times as long as its greatest width, upper half or more blackened; hind femur with several long bristles on apical half of anteroventral surface..... *winnemanae* Malloch.

11. Ovipositor of female nearly as wide as frons; calyptrae and their fringes white; tarsi largely yellowish; scutellum without fine hairs.

arkansensis Malloch.

Ovipositor slender, much narrower than frons; scutellum usually with fine hairs in addition to the strong bristles..... 12

12. Face and parafacials when viewed from above conspicuously whitish pruinulent; frons of female dark steel-blue, shining, sparsely and evenly haired, and with a transverse depression midway between anterior margin and anterior ocellus; third antennal segment but little longer than wide; a strong curved bristle near anterior margin of cheek; tarsi slightly pale basally; calyptrae and their fringes brown; no fine hairs on scutellum.

albiceps Malloch.

Face but little whitish pruinulent when viewed from above; frons not steel-blue, and without a transverse depression; cheek either without a strong bristle or with several..... 13

13. Legs entirely black..... 14

At least the bases of tarsi yellowish..... 17

14. Fringes of calyptrae brown or fuscous..... 15

Fringes of calyptrae white; cheek without strong bristles..... 16

15. Cheek with four outstanding bristles; no hairs between the scutellar bristles; frons slightly bluish or greenish; third antennal segment about 1.5 as long as wide..... *quadrissetosa* Malloch.

Cheek without outstanding bristles; some fine hairs between the apical pair of scutellar bristles; frons black..... *angustitarsis* Malloch.

16. Some fine hairs between the apical pair of scutellar bristles.

vaginalis Fallen.

No fine hairs between the apical pair of scutellar bristles.

marylandica Malloch.

17. Frontal lunule bare; fringes of calyptrae brown; interfrontalia with two series of incurved hairs on center; glossy portion of upper orbits microscopically strigose..... *aberrans* Malloch.
Frontal lunule with setulose hairs at least on the sides except in *nigrociliata*; fringes of calyptrae whitish or yellowish except in *nigrociliata* and *subpolita*; glossy portion of upper orbits usually smooth (compare *occidentalis* and *coloradensis*)..... 18
18. No minute hairs between the apical pair of scutellar bristles; third antennal segment not or barely over twice as long as its greatest width..... 19
Some minute hairs between the apical pair of scutellar bristles; third antennal segment more than twice as long as its greatest width..... 20
19. Tarsi brown; larger species, fully 4 mm. in length..... *marylandica* Malloch.
Tarsi pale yellow; smaller species, less than 4 mm. in length..... *laticornis* Meigen.
20. Fringes of calyptrae fuscous..... 21
Fringes of calyptrae white or yellow; thorax and abdomen bluish..... 22
21. Frontal lunule bare; head and thorax black, abdomen slightly bluish, *nigrociliata* Malloch.
Frontal lunule hairy; thorax and abdomen blackish blue..... *subpolita* Malloch.
22. Width of male frons at anterior margin equal to at least half the entire length of frons; preapical dorsal pair of hairs on ovipositor very long; hairs at angle of calyptrae much longer than rest of fringe; upper orbits largely microscopically strigose..... *occidentalis* Malloch.
Width of male frons at anterior margin not nearly equal to half its entire length; preapical dorsal hairs on ovipositor very short; fringes of calyptrae of uniform length..... 23
23. Third antennal segment about twice as long as wide; upper frontal orbits granulose..... *coloradensis* Malloch.
Third antennal segment at least three times as long as wide; upper frontal orbits largely or entirely polished..... 24
24. Only the basal segment of each tarsus yellow..... *longicornis* Williston.
Basal two or three segments of each tarsus yellow..... 25
25. Larger species, over 4 mm. in length; hypopygium as in Figure 3, *nudifemorata* Malloch.
Smaller species, less than 4 mm. in length; hypopygium of male as in Figure 1..... *polita* Say.

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

L. aberrans Malloch.—Mount Vernon, Virginia, April 19, 1917, McAtee.

* *L. albiceps* Malloch.—Washington, District of Columbia, May 29, 1912, McAtee.

L. laticornis Meigen.—Common and widely distributed; dates of collection range from May 8 to October 3; comes to light. P. I.

* *L. marylandica* Malloch.—Plummer Island, Maryland, bred April 24, 1915, from larva collected under bark, April 7, H. S. Barber.

* *L. nudifemorata* Malloch.—Plummer Island, Maryland, April 21, 1912, McAtee; Falls Church, Virginia, May 10, N. Banks.

L. polita Say.—The most numerous species; the season for active imagines runs from March 29 to October 29; the species has been

bred from old pumpkin vines, cabbage stalks, and butternut hulls; comes to light. P. I.

L. ruficornis Malloch.—Washington, District of Columbia, May 29, 1914, L. O. Jackson.

* *L. quadrisetosa* Malloch.—Plummer Island, Maryland, August 11, 1912, McAtee; June 3, 1914, R. C. Shannon; District of Columbia. D. W. Coquillett.

L. vibrissata Malloch.—Cupid's Bower Island, Maryland, July 8, 1915, R. C. Shannon; Stubblefield Fall, Virginia, October 23, 1921, Malloch; Falls Church, Virginia, May 10, N. Banks; Mount Vernon, Virginia, July 4, 1917, at honey dew, McAtee.

* *L. winnemanæ* Malloch.—Cupid's Bower Island, Maryland, July 8, 1915; Dead Run, Virginia, April 11, 1915, R. C. Shannon; Virginia near Plummer Island, April 18, 1909, McAtee; Falls Church, Virginia, June 6, August 25, N. Banks; College Park, Maryland, May 25, 1913, F. Knab.

Family PALLOPTERIDAE.

This family is represented by but one genus in North America, a key to the species of which follows:

Genus PALLOPTERA Fallén.

KEY TO SPECIES.

1. Thorax with one or two pairs of dorsocentral bristles, the anterior one when present weak; propleural bristle absent; stigmatal bristle weak or absent; prescutellar pair of acostichals absent..... subarcuata Johnson.
Thorax with four pairs of dorsocentrals, the anterior pair sometimes weak..... 2
2. Mesopleura bare..... 3
Mesopleura setulose..... 8
3. Both cross-veins of wings unclouded..... 4
At least the outer cross-vein of wings distinctly clouded..... 6
4. Humeri entirely gray, concolorous with disk of thorax
claripennis Malloch, new species.
Humeri yellow, contrasting with the gray disk of thorax..... 5
5. Thorax with about four series of weak whitish hairs between the anterior pair of dorsocentrals; stigmatal bristle absent..... terminalis Loew.
Thorax with about eight series of short black setulose hairs between the anterior pair of dorsocentrals; stigmatal bristle present but weak
ustulata Meigen.
6. Thorax gray, densely pruinulent, humeri yellow; wing with the costal cell almost entirely infuscated, and an infuscation at apex
subusta Malloch, new species.
Thorax yellowish; wing with the entire costal region broadly infuscated..... 7
7. Propleural and stigmatal bristles both absent; head thorax, and abdomen grayish pruinulent..... setosa Melander.
Propleural bristle present; stigmatal bristle absent; thorax and abdomen not gray pruinulent..... albertensis Johnson.

8. Abdomen without distinct black markings on tergites..... 9
 Abdomen with either round spots or black vittae on apices of tergites... 10
 9. Costa brown from near base to apex..... *juvunda* Loew.
 Costal cell and a space beyond apex of first vein hyaline..... *arcuata* Fallen.
 10. Abdominal tergites with conspicuous black spots near apices from which
 the bristles arise; propleural bristles absent..... *superba* Loew.
 Abdominal tergites with the posterior margins narrowly and the sides
 broadly black; propleural bristle present..... *similis* Johnson.

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

P. superba Loew.—A handsome fly which is fairly numerous in damp shady localities of the Piedmont region; it has been collected from June 8 to October 28; and is known to come to light. P. I.

DESCRIPTIONS OF TWO WESTERN SPECIES.

The two following new species have the head, scutellum, abdomen and legs yellowish testaceous, and the thorax black with dense gray pruinescence. In *claripennis* the humeri are also gray, while in *subusta* they are yellowish testaceous.

PALLOPTERA CLARIPENNIS Malloch, new species.

Male.—Distinguished from all other species of the genus by the entirely clear wings. Structurally similar to *ustulata*.

Length, 3.25 mm.

Type.—Palo Alto, California, August 3, 1895, Lot. 84, (Type Cat. No. 26387, U.S.N.M.)

PALLOPTERA SUBUSTA Malloch, new species.

Male.—Differs from *usta* Meigen in having the fuscous markings of wings smaller, the one at apex of wing being much less distinct, that on outer cross-vein not extending behind fifth vein, and the infuscation in subcostal cell not extending beyond the veins bounding the cell. The abdomen is pale yellowish testaceous, not black.

Length, 4–5 mm.

Type and one paratype.—Palo Alto, California, August 3, 1895; one paratype, Stanford University, California, September 30, 1901. (Type Cat. No. 26388, U.S.N.M.)

Family SAPROMYZIDAE.

KEY TO GENERA.

1. Basal antennal segment elongated, as long as or almost as long as the elongated second segment, with some minute setulose hairs at apex below; third segment much more than four times as long as wide, appearing cylindrical; face convex..... 2
 Basal antennal segment short, not as long as second, bare at apex below... 4

2. Sternopleurum with two strong bristles; arista with very dense short hairs above and below..... *Lauxania Latreille.*
- Sternopleurum with only one strong bristle; arista long haired above... 3
3. Marginal cell of wing very much narrower than submarginal, equally wide on its entire length..... *Steganolauxania Frey.*
- Marginal cell at its widest part as wide as submarginal, much narrowed from apex of first vein basad..... *Lauxaniella Malloch.*
4. Anterior orbital bristle absent..... *Periscelis Loew.*
- Anterior orbital bristle present..... 5
5. Anterior orbital bristle directed inward..... 6
- Anterior orbital bristle directed backward..... 8
6. Ocellar bristles minute; face much swollen, projecting very much beyond eyes in profile; anterior pair of orbital bristles small, closer together than the upper pair, and situated very distinctly nearer to bases of antennae than to upper pair..... *Physogenia Macquart.*
- Ocellar bristles long and strong; face not or but little projecting; anterior orbital bristles large..... 7
7. Anterior orbital bristles strong, situated about midway between bases of antennae and upper pair and in line with them; face glossy, with a distinct rounded central convexity; third antennal segment slender, longer than height of head..... *Pachycerina Macquart.*
- Anterior pair of orbital bristles moderately strong, situated very close to upper pair; face not glossy, with a very slight longitudinal convexity or almost flat; third antennal segment tapered, not as long as height of head, *Camptoprosopella Hendel.*
8. Either second or third wing-vein with setulose hairs basally..... 9
- Second and third wing-veins bare..... 11
9. Setulae present on base of second vein before furcation of third, *Xorochaetina Malloch.*
- Setulae present on base of third vein distad of furcation from second... 10
10. Fore femur with a comb of short black setulae on apical third of antero-ventral surface; pteropleura with some fine black hairs in center, *Eusapromyza Malloch (European).*
- Fore femur without a comb of setulae as above; pteropleura bare, *Peplomyza Haliday (European).*
11. Presutural bristle absent; head longer than high, face much receding below; orbits rather densely covered with minute black hairs at bases of antennae, *Trigonometopus Macquart.*
- Presutural bristle present; head higher than long, the face not much receding below, and the orbits not noticeably haired at bases of antennae..... 12
12. Sternopleurum with one strong bristle..... 13
- Sternopleurum with two strong bristles, the anterior one the weaker... 14
13. Frons broader than long, concave in center anteriorly; ocellar bristles minute; thorax with three pairs of dorsocentrals and one pair of prescutellar acrostichals..... *Neogriphoneura Malloch.*
- Frons sometimes longer than broad, not concave in center anteriorly; thorax with two pairs of dorsocentrals..... *Decela Malloch.*
14. Face decidedly and evenly convex, glossy..... *Caliope Haliday.*
- Face flat or not evenly convex, opaque or subopaque..... 15
15. Intra-alar bristle present; the small black costal setulae on wing continued beyond apex of second vein but not extending to apex of third, *Minettia Robineau-Desvoidy.*
- Intra-alar bristle absent..... 16

16. Scutellum convex above, much broader than long; second wing-vein undulated; face with a slight transverse ridge near mouth-margin; wing fuscous, with small clear spots.....*Trypetisoma* Malloch.
Scutellum more or less flattened above; second wing-vein not undulated; face without a transverse ridge; wings not marked as above..... 17
17. The small black setulae continued beyond apex of second vein but not continued to apex of third.....*Sapromyza* Fallen.
The small black costal setulae continued to apex of third vein where they abruptly cease.....*Sapromyzosoma* Malloch.*

Genus LAUXANIA Latreille.

KEY TO SPECIES.

1. Knobs of halteres, bases of wings, and fore legs except the bases of tibiae black; dorsocentrals 3.....*cylindricornis* Fabricius.
Knobs of halteres, bases of wings, and a part of fore legs yellowish..... 2
2. Dorsocentrals 3; fore tibiae black.....*nigrimanus* Coquillett.
Dorsocentrals 4; fore tibiae yellow.....*albiseta* Coquillett.

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

L. cylindricornis Fabricius.—Fairly numerous in Piedmont localities; has been collected from April 16 to June 29. P. I.

Genus STEGANOLAUXANIA Frey.

This genus is represented in our general region by one species, *latipennis* Coquillett. The genus was erected by Frey in 1918 and is closely related to *Steganopsis* de Meijere described from the Dutch East Indies.

Genus LAUXANIELLA Malloch.

Generic characters.—Differs from *Lauxania* in having only one sternopleural bristle. In the structure of the antennae it is similar to that genus and differs from other genera.

Genotype.—*Lauxania femoralis* Loew.

KEY TO SPECIES.

1. Knobs of halteres yellow; interfrontalia largely velvety black; thoracic dorsum not vittate..... 2
Knobs of halteres black; interfrontalia not velvety black; thoracic dorsum vittate..... 3
- Knobs of halteres whitish, a velvety black spot on each side of interfrontalia at middle and another on outer side of orbit at middle; prescutellar acrostichals present; dorsum of thorax not vittate, scutellum entirely velvety black; wings yellowish; tibiae and tarsi yellowish white (Texas),
signatifrons (Coquillett).

* *Sapromyzosoma obtusifrons* male has the costal setulae very weak near the apex of third vein, but the marked wings, yellow color, and other characters associate it more definitely with this genus than with *Sapromyza*. The female is typical of this genus.

2. Prescutellar acrostichals absent; tibiae and metatarsi of fore legs black, apical four tarsal segments white; wings largely infuscated; scutellum not velvety black..... *manuleata* (Loew).
 Prescutellar acrostichals present; tibiae and tarsi of fore legs white; wings yellowish; scutellum largely velvety black..... *femoralis* (Loew).
 3. Median dorsal vitta of thorax continued to posterior margin, not attenuated posteriorly; orbits entirely gray pruinulent; wings but little darkened at bases; stout species..... *opaca* (Loew).
 Median dorsal vitta of thorax not continued to posterior margin, or if so only as a slender line; orbits only gray pruinulent round bases of bristles; wings fuscous at bases; slender species..... *trivittata* (Loew).

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

L. femoralis Loew.—Spring Hill, Virginia, August 26, 1922, H. L. Viereck; Falls Church, Virginia, June 26, July 5, August 24, September 17; High Island, Maryland, July 8, N. Banks; Glen Echo, Maryland, August 3, 6, 1922, L. L. Buchanan; July 30, August 2, 1922, Malloch.

L. trivittata Loew.—Has been collected several times in the Piedmont area, at dates ranging from June 14 to August 22; taken twice on flowers of *Ceanothus americanus*. P. I.

Genus PHYSOGENIA Macquart.

We have seen but one species from America, *vittata* Macquart, represented in material from Cuba, Brazil, and Nicaragua.

Genus PACHYCERINA Macquart.

We have seen only one species of this genus from America, represented by specimens from Florida and Nicaragua. These were named *flavida* Wiedemann, by Coquillett, and probably are the same species as *ornata* Melander, described from Mexico, synonymy we venture even though Wiedemann's description of the thoracic coloration does not agree exactly with that of the specimens above referred to.

Genus CAMPTOPROSOPELLA Hendel.

Two species of this genus occur in our region which may be separated by the characters cited below.

KEY TO SPECIES.

- | | |
|---|-------------------------|
| 1. Wings hyaline, immaculate..... | 2 |
| Wings fuscous or marked with fuscous..... | 3 |
| 2. Fore legs not darker than mid and hind pairs; arista loosely long plumose, <i>vulgaris</i> Fitch. | |
| Fore legs distinctly darker than mid and hind pairs, the tarsi and apices of tibiae subfuscous; arista with shorter and more dense plumosity; hypopygium as in Figure 17..... | <i>verticalis</i> Loew. |

3. Wings entirely or almost entirely fuscous; thorax with a medium brown vitta..... *dolorosa* Williston.
 Wings with the cross-veins and costal and apical margins fuscous; thorax yellow..... *maculipennis* Malloch.

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

O. verticalis Loew.—Much rarer than *vulgaris*; Woodridge, District of Columbia, August 22, 1915, J. Silver; Beltsville, Maryland, June 9, 1915, August 14, 1914, McAtee. Has been taken in Illinois in sandy regions along the Mississippi River and we have also seen it from Florida.

O. vulgaris Fitch.—The commonest species of the family in North America, occurring throughout our region in woodlands; extreme dates of collection; May 20 and October 12; comes to light; occasionally on flowers. P. I.

Genus XENOCHAETINA Malloch.

Generic characters.—Similar in general habitus to *Caliope*, but the base of the second wing-vein has one or two small setulae on upper side. The fore femur has a comb of minute setulae beyond middle on anteroventral surface as in many species of *Sapromyzosoma*.

Genotype.—*Lauzania muscaria* Loew.

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

X. muscaria Loew.—Common in the Piedmont region; the season as at present known extends from May 14 to October 16. P. I.

Genus TRIGONOMETOPUS Macquart.

A key to the species of this genus appeared in 1923.³

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

T. vittatus Loew.—Stubblefield Fall, Virginia, October 23, 1921, Malloch.

Genus NEOGRIPHONEURA Malloch.

Generic characters.—Frons concave on anterior half in center, viewed from above the anterior margin has a rounded central emargination; ocellar bristles minute, very much smaller than the post-vertical pair; anterior orbital bristles long and strong, directed slightly mesad and caudad; eyes tapered below; face slightly convex, the lower margin a little protuberant; mouth with a slight rim; arista plumose above, short haired on apical half below; sternopleu-

³ Proc. Ent. Soc. Wash., vol. 25, p. 48, 1923.

rum with one strong bristle; area of mesonotum between dorsocentral and supra-alar bristles bare; hypopygium small; costa as in *Minettia*.

Genotype.—*Sapromyza sordida* Wiedemann.

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

N. sordida Wiedemann.—Dead Run, Virginia, August 3, 1915, V. A. Roberts. This species is represented also in material examined by us from Sebastian and Paradise Key, Florida, and Knoxville, Tennessee. It was originally described from the West Indies, and has been recorded from Porto Rico, St. Vincent, and Georgia in addition to the above. It is represented in the United States National Museum collection by specimens from Lake Worth, Florida, Texas, and Nicaragua.

Genus DECEIA Malloch.

Generic characters.—Differs from *Minettia* in having one sternopleural bristle, and two pairs of dorsocentrals, and the intra-alar absent. All tibiae with a preapical dorsal bristle. From *Lawsoniella* it differs in having the basal antennal segment very much shorter than the second and bare at apex below, and third not four times as long as its greatest width except in *incongrua*.

This genus is divisible into four subgenera, as indicated in the key given below. The genus contains some species which appear to be related to other genera about as closely as they are to the typical species and in the future when material from other faunal regions is carefully studied it may be necessary to recognize as valid genera the groups now accepted as subgenera.

KEY TO SUBGENERA.

1. Frons distinctly longer than wide, rounded in profile; face and frons opaque; fore tibia of males distinctly and rather abruptly swollen from near base on dorsal surface; eyes narrowed below; upper side of arista with longer hairs than lower side..... *Deceia* Malloch.
Frons not longer than wide or if so not rounded in profile and the characters not otherwise as above..... 2
2. Frons longer than wide, flat in profile and opaque; face subopaque; eyes distinctly narrowed below..... *Neodeceia* Malloch.
Frons either not longer than wide or the face is distinctly glossy..... 3
3. Eyes distinctly narrowed below; frons more or less shining, but not uniformly so; face glossy, distinctly convex..... *Melanomyza* Malloch.
Eyes not narrowed below; frons uniformly subopaque; face almost flat, slightly shining..... *Trivialia* Malloch.

Subgenus NEODECEIA Malloch.

This subgenus is represented by but one species in the fauna of the United States. It does not occur within our region, being confined to Florida and Cuba so far as known.

Type of the subgenus.—*Lawsonia cineracea* Coquillett.

Subgenus TRIVIALIA Malloch.

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

* *Deceia (Trivialia) fuscocapitata* Malloch.—This species has been taken only once, in Virginia near Plummer Island, July 4, 1915, McAtee.

Subgenus DECEIA Malloch.

Type of the subgenus.—*Sapromyza crevecoeuri* Coquillett.

KEY TO THE SPECIES.

- Ocellar bristles parallel, at least as long as anterior orbitals and much longer than postvertical pair; the longest hairs on upper side of arista shorter than third antennal segment; palpi fuscous; fore tarsi whitish yellow..... *crevecoeuri* Coquillett.
Ocellar bristles divergent, much shorter than the anterior orbitals and equal to postvertical pair; longest hairs on upper side of arista as long as third antennal segment; palpi yellow; fore tarsi whitish, apical segment in male black, in female brownish..... *wetmorei* Malloch.

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

D. crevecoeuri Coquillett.—Has been taken a number of times on Plummer Island, Maryland, from June 30 to August 6 (once at light); and at Glen Echo, Maryland, June 25 to August 22.

Subgenus MELANOMYZA Malloch.

Type of the subgenus.—*Lauxania gracilipes* Loew.

KEY TO SPECIES.

- Frons without velvety black markings; hairs on upper side of arista barely longer than those on under side; antennae extending slightly beyond mouth-margin, third segment at least four times as long as wide; scutellum without velvety black margin..... *incongrua* Malloch.
Frons with velvety black markings; hairs on upper side of arista much longer than those on under side; antennae not extending to mouth-margin, third segment not three times as long as wide; scutellum more or less broadly velvety black on posterior margin..... 2
- Frons with a large subquadrate velvety black spot in center anteriorly; ocellar triangle very short, not extending to middle of frons,..... *gracilipes* Loew.
Frons with a wedge-shaped black mark on each side of interfrontalia anteriorly, frontal triangle extending to anterior margin of frons, rather broad anteriorly; orbits almost glossy, the shining stripe not interrupted between the bristles; scutellum velvety black only on margin,..... *intermedia* Malloch.
Frons largely velvety black anteriorly but more conspicuously so on the same areas as *intermedia*, the frons not so distinctly shining on orbits, the latter shining only on two small spots surrounding bases of the bristles,..... *scutellata* Malloch.

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

D. gracilipes Loew.—Common; has been collected from June 19 to September 17; in copula August 6; comes to light. P. I.

**D. intermedia* Malloch.—Common; the known season extends from June 11 to September 12; is attracted to light. P. I.

**D. scutellata* Malloch.—Common; dates of collection range from May 30 to August 29; obtained thus far only in Piedmont localities. P. I.

Genus CALIOPE Haliday.

We have retained in this genus two species which appear to be closely related to the genotype, but as the latter is not available to us we can not say definitely whether they really belong to the genus or not. The two species may be separated by means of the synopsis below.

KEY TO SPECIES.

1. Intra-alar bristle present; sternopleurum with two bristles; species yellow,
lutea (Coquillett).
- Intra-alar bristle absent; sternopleurum with two bristles; species largely
black----- flaviceps Loew.

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

**C. flaviceps* Loew.—Rosslyn, Virginia, April 23, 1913, R. C. Shannon.

Genus MINETTIA Robineau-Desvoidy.

KEY TO SPECIES.

1. Knobs of halteres black; prosternum bare; thorax and abdomen black. 2
- Knobs of halteres yellow; prosternum usually with a few hairs----- 4
2. All tarsi yellowish; male hypopygial forceps slender, heavily chititized and
glossy on their apical halves; face with two small rounded humps near
mouth margin----- longipennis Fallen.*
- Only mid and hind tarsi yellowish, the fore pair blackened; hypopygial
forceps of male stout; face without two small humps as above----- 3
3. Thorax with four pairs of dorsocentral bristles; usually four series of
setulae between the dorsocentrals; male hypopygium as in figures 5, 6, 7,
americana Malloch.
- Thorax with three pairs of dorsocentrals; six series of setulae between the
dorsocentrals; male hypopygium as in figure 8----- obscura Loew.
4. Thorax and scutellum black, densely pale gray pruinulent, the margin of
scutellum sooty black; abdomen yellowish testaceous; not annulated, fore
and mid femora and fore tibiae partly blackened male hypopygium as in
figure 9----- lupulina Fabricius.
- Thorax and scutellum not as above; if gray pruinulent the scutellum
has no sooty black margin----- 5

* This species has been recorded from North America, but erroneously. The records without doubt refer to one or other of the next two species in key.

5. Face pale shining testaceous, with a round shining brown or blackish spot on each side at middle; frons and parafacials concolorous with face, the former with three elongate black stripes, the latter with two round blackish spots, one at base of antenna and the other below eye,

eucephala Loew.

Face not as above, unspotted, with a single central velvety black spot, or if with two blackish spots the entire head is densely gray pruinulent and the other markings are not as above..... 6

6. Face without a central velvety black spot..... 7

Face with a central velvety black spot..... 15

7. Thorax largely or entirely blackish and densely gray pruinulent; hind tibia with a fuscous band near base and another at apex..... 8

Thorax and abdomen yellowish testaceous, shining; hind tibia unicolorous yellowish, not annulate..... 11

8. Palpi black; large species, about 5 mm. in length; abdomen gray pruinulent, the apical two segments each with a narrow fuscous fascia, scutellum not subtruncate at apex..... *buchanani* Malloch, new species.

Palpi yellow; species in other respects not as above..... 9

9. Large species, 5-6 mm. in length; each abdominal tergite with a fuscous fascia anteriorly..... *magna* Coquillett.

Smaller species, averaging less than 4 mm. in length; abdominal tergites without complete fasciae..... 10

10. Each abdominal tergite with a brownish black transverse spot on each side; abdomen yellowish..... *glauca* Coquillett.

Abdomen yellowish testaceous and without lateral spots..... *cana* Melander.

11. One of the setulae near upper extremity of the series on side of face strikingly longer and stronger than the others; arista almost bare,

ordinaria Melander.

All the lateral facial hairs small and weak; arista plumose or short-haired..... 12

12. Arista plumose; dorsum of thorax immaculate or with a more or less distinct grayish or fuscous median stripe; ocellar bristles longer than postvertical pair; second abdominal tergite of female with several long bristles on each side of posterior margin; abdomen unspotted but sometimes indistinctly fasciate..... 13

Arista short-haired, small species, not over 3 mm. in length; dorsum of thorax with a small brown spot at base of each bristle and hair; ocellar bristles very small; abdomen with a blackish central spot on each tergite except the first, and a smaller spot on each side of the apical two or three tergites..... *punctifer* Malloch.

13. Wings distinctly infuscated..... *fumipennis* Melander.

Wings yellowish..... 14

14. Thorax immaculate..... *flaveola* Coquillett.

Thorax with a grayish or fuscous central stripe,

flaveola, var. *univittata* Coquillett.

15. Scutellum with a black mark on each side; base of antennae black..... 16

Scutellum and antennae entirely yellow..... 17

16. Pleura immaculate..... *octopunctata* Wiedemann.

Pleurae with one or two black spots. *octopunctata*, var. *slossonae* Coquillett.

17. Thorax quadrivittate; abdomen with conspicuous brown spots,

valida Walker.

Thorax and abdomen testaceous, immaculate..... *puncticeps* Coquillett.

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

**M. americana* Malloch.—Common; has been collected from April 24 to June 22. P. I.

**MINETTIA BUCHANANI* Malloch, new species.

Male.—Similar in color to *magna*, but the palpi are black, and the abdomen is densely gray pruinose with a narrow fuscous fascia on middle of third and another on fourth tergites. The general habitus is similar to that of *magna*, but the arista has the hairs shorter than width of third antennal segment, the scutellum is not subtruncate apically between the bristles, there are more outstanding setulae in center of mesopleura which extend to below the bristle, and the size is smaller.

Length, nearly 5 mm.

Type.—Beltsville, Maryland, May 21, 1922, swept from herbage in woodland (J. R. Malloch). Cat. No. 26389 U. S. N. M.

**M. glauca* Coquillett.—Great Falls, Virginia, May 19, 1915, McAtee; Virginia near Plummer Island, May 20, 1914, R. C. Shannon; Maryland near Plummer Island, June 5, 1903, W. V. Warner; Beltsville, Maryland, May 2, 1915, on flowers of *Aronia arbutifolia* McAtee; Marlboro, Maryland, May 13, H. S. Barber.

M. lupulina Fabricius.—Very common; the extreme dates of collection are May 14 and October 5; has been taken on flowers of *Ceanothus americanus*, and *Tephrosia virginica*. P. I.

**M. magna* Coquillett.—This, the largest local species of the family, is fairly common; it has been collected from May 31 to September 17. V: P. I.

M. obscura Loew.—Very common; the season as at present known runs from April 25 to June 29; comes to light; and has been collected on the flowers of *Aruncus aruncus*. P. I.

M. ordinaria Melander.—Plummer Island, Maryland, August 26, 1902, E. A. Schwarz and H. S. Barber; Chain Bridge, Virginia, September 18, 1921, Malloch; Washington, District of Columbia, August 13, N. Banks.

M. puncticeps Coquillett.—Plummer Island, Maryland, May 25, 1902, H. S. Barber; May 23, 1914, June 8, 1914, at light, R. C. Shannon; June 15, 1905. D. H. Clemons.

M. valida Walker.—Has been collected several times at dates ranging from May 1 to October 14; comes to light. P. I.

Genus SAPROMYZA Fallén.

KEY TO SPECIES.

1. Wings black, with numerous small clear spots, the most conspicuous one at apex; head, thorax and apical abdominal segment with numerous small

brown spots and dots, the greater part of abdomen dark brown, with pale gray pruinose spots at bases of bristles and setulae; thorax with four pairs of dorsocentrals and four or five pairs of strong acrostichals,

stictica Loew.⁵

Wings clear, or at least without small clear spots on a dark ground. 2

2. Wings with the anterior, or costal, half, and the cross-veins browned; thorax quadrivittate with brown, and with three pairs of dorsocentrals and only one, prescutellar, pair of strong acrostichals; second costal division less than half as long as first; one genal hair much longer and stronger than the others. umbrosa Loew.

Wings entirely hyaline; thorax with one pair of acrostichals. 3

3. Frons wholly glossy black, sometimes yellowish on anterior margin; thorax and abdomen wholly black, shining, the former with four pairs of dorsocentrals; face glossy black in center; second costal division a little less than half as long as first. 4

Frons not wholly glossy black, usually some part of it yellowish and except in the entirely yellow species with distinct pruinescence; if largely or entirely shining black, there are only three pairs of dorsocentrals; thorax with two to four pairs of dorsocentrals. 5

4. Face and frons highly glossy, without pruinescence; third antennal segment at least four times as long as wide, not tapered to apex; longest hairs on arista decidedly longer than its basal diameter; acrostichals between dorsocentrals in two series. quadrisetosa Thomson, variety.

Face with distinct gray pruinescence below antennae; third antennal segment not over 2.5 times as long as broad, tapered apically; longest hairs on arista not longer than its basal diameter; acrostichals between dorsocentrals in four series. nigerrima Melander (=blaisdelli Cresson).

Face with distinct gray pruinescence below antennae; third antennal segment at least three times as long as broad, tapered apically; longest hairs on arista longer than its basal diameter; acrostichals between dorsocentrals in four series. quadrisetosa Thomson (=vanduzeei Cresson?).

5. Thorax with four pairs of dorsocentrals and distinct brown vittae; abdomen with brown dorsal spots; second costal division much shorter than half as long as first. 6

Thorax with two or three pairs of dorsocentrals; second costal division almost or quite half as long as first. 10

Thorax with four pairs of dorsocentrals, and without vittae; abdomen largely fuscous, without dorsal spots; second costal division fully half as long as first; legs entirely yellow; a large portion of third antennal segment and the palpi fuscous. fusciventris Malloch.

6. Fore femur without a comblike series of minute setulae between middle and apex on anteroventral surface; bristles on posterior margins of dorsal abdominal segments not set in black or brown spots; no dark spot in front of mesonotal suture laterad of the outer vitta. 7

Fore femur with a comblike series of minute setulae between middle and apex on anteroventral surface; bristles on posterior margins of dorsal abdominal segments set in black or brown spots; a brown or fuscous spot in front of suture on mesonotum laterad of the outer vitta. 9

⁵ See p. 25. This is now placed in a new genus but because of similarity to species of *Sapromyza* is included in the above key.

7. Apices of tibiae pale; superior forceps of male hypopygium long, but not very slender, their inner margins on apical third minutely serrate, inferior pair cleft at apices, the arms of dissimilar lengths; fifth sternite with two slender chitinated processes on posterior margin which are directed backward (figs. 10, 10a); no dark spot in middle of mesopleurum.

serrata Malloch.

Apices of tibiae blackened; superior forceps of male hypopygium not serrated on inner margins apically; usually a distinct brown spot in middle of mesopleurum.----- 8

8. Superior forceps of male hypopygium short and stout, inferior pair with the apical branches of almost equal size; fifth sternite of male with two slender backwardly directed processes on posterior margin (figs. 11, 12).

obtusilamellata Malloch.

Superior forceps of male hypopygium long and slender, branches of inferior pair unequal in size (figs. 15, 15a); fifth sternite of male without processes on posterior margin.----- *quadrilineata* Loew.

9. Superior forceps of male hypopygium long and slender, inferior pair long and slender, much curved, with a short tooth beyond middle (fig. 18); larger species, 4 mm. in length, color pale, the spots on abdomen sometimes but little darker than remainder of segment; central pale stripe on mesonotum distinctly narrowed at anterior extremity.----- *annulata* Melander.

Superior forceps of male hypopygium short and stout, their apical margins concave (figs. 14, 14a); small species, 3 mm. in length; color darker, the spots on abdomen always fuscous and much darker than remainder of segment; central pale stripe on mesonotum not distinctly narrowed at anterior extremity.----- *pictiventris* Malloch.

10. Thorax with two pairs of dorsocentrals; shining yellow species with a round shining black spot on each side of the apical two or three abdominal tergites.----- *rotundicornis* Loew.

Thorax with three pairs of dorsocentrals, abdomen not as above.----- 11

11. Yellow species; frons glossy, with a black spot in middle; apical half of third antennal segment black (Wyoming, Montana).----- *cyclops* Melander.

Yellow species; frons shining unicolorous yellow; third antennal segment slightly infuscated above on apical half.----- *monticola* Melander.

Black species frons largely, antennae entirely, blackish.----- 12

12. Face with a round black or brown spot on each side in center; densely pale gray pruinose species; thorax vittate; tibia with a pale band at base and another beyond middle.----- *vittigera* Coquillett.

Face immaculate; moderately pruinose species, with the thorax not vittate and tibia not banded.----- 13

13. Face and frons highly polished, only the facial orbits gray pruinose; face slightly bulbous in center just below antennae; third antennal segment at least three times as long as wide; arista short haired; acrostichals in four irregular series.----- *elisae* Meigen.

At least the face gray pruinose, not bulbous; third antennal segment about twice as long as wide.----- 14

14. Frons opaque, indistinctly reddish on anterior margin; thorax opaque, with rather dense brownish pruinescence, the acrostichals in two series; arista nearly bare.----- *brachysoma* Coquillett.

Frons shining, especially on orbits, conspicuously reddish testaceous on anterior margin; thorax shining, faintly gray pruinose, the acrostichals in four series between anterior dorsocentrals; arista pubescent,

hyalinata Meigen (= *nigrans* Melander).

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

S. annulata Melander.—Fairly common in Piedmont areas; has been taken at Difficult Run, Virginia, September 14, 1913, R. C. Shannon; on Plummer Island, Maryland, June 8, 1914, at light, June 14, 1913, and July 31, 1913, R. C. Shannon; May 30, 1907, and June 7, 1914, McAtee, August 3, 1915, at light, V. A. Roberts; at Glen Echo, Maryland, at six dates extending from July 10 to August 28, Malloch; Maywood, Virginia, May 21, 1922, McAtee; and Beltsville, Maryland, May 21, 1922, Malloch.

S. brachysoma Coquillett.—Stubblefield Fall, Virginia, October 23, 1921, Malloch; Dead Run, Virginia, March 13, 28, 1915, March 12, 1916, March 13, 1922; April 4, 1915; and Maryland near Plummer Island April 5, 1914, R. C. Shannon.

**S. obtusilamellata* Malloch.—Glen Echo, Maryland, July 17, 23, 1921, June 11, 1922; Cabin John, Maryland, July 31, 1921, Malloch.

**S. pictiventris* Malloch.—Fairly common; the season as at present known extends from April 23 to August 24. P. I.

S. quadrilineata Loew.—Very common; extreme dates of collection are April 24 and September 23; comes rather frequently to light. P. I.

**S. serrata* Malloch.—District of Columbia, D. W. Coquillett; Rock Creek, District of Columbia, June 15, 1913, R. C. Shannon; Glen Echo, Maryland, June 1, 18, 25, July 2, 9, 1922, Malloch.

**S. umbrosa* Loew.—Plummer Island, Maryland, June 8, 1914, at light, E. A. Schwarz and R. C. Shannon; Glen Echo, Maryland, June 25, July 2, 1922, Malloch; Beltsville, Maryland, June 23, 1918, July 4, 1915, McAtee; June 25, 1915, R. C. Shannon; May 21, 1922, Malloch; Odenton, Maryland, June 20, 1915, June 11, 1922, McAtee.

S. vittigera Coquillett.—Stubblefield Fall, Virginia, October 23, 1921; Glen Echo, Maryland, June 11, 1922, Malloch.

Genus SAPROMYZOSOMA Malloch.

KEY TO SPECIES.

1. Wings with at least both cross-veins and the apices of second, third, and fourth veins distinctly infuscated..... 2
- Wings with at most the cross-veins distinctly infuscated..... 16
2. Third vein with two fuscous spots in addition to the one at inner cross-vein and the one at apex..... 3
- Third vein with only one fuscous spot in addition to the one at inner cross-vein and the one at apex..... 6

3. Hind femur of male with many black setulae ventrally; thorax with three pairs of dorsocentral bristles; arista long haired; hind femur without preapical anteroventral bristle..... *notata* Fallen [European only].
Hind femur of male without black setulae ventrally; arista short haired. 4
4. Hind femur without an anteroventral bristle near apex; thorax with four pairs of dorsocentrals..... *occidentalis* Malloch.
Hind femur without an anteroventral bristle near apex; thorax with three pairs of dorsocentrals; arista very short haired,
deceptor Malloch, new species.
Hind femur with a rather strong outstanding anteroventral bristle near apex; thorax with three pairs of dorsocentrals..... 5
5. Eighth abdominal tergite with a backwardly directed spine at apex of the downwardly directed lateral extension on its posterior angle; hypopygium as Figures 18, 20, and 21..... *fraterna* Loew.
Eighth abdominal tergite with a slightly curved downwardly directed spine at apex of the lateral process on its anterior angle; hypopygium as in Figures 24 and 26..... *pernotata* Malloch.
6. Second, and sometimes part of basal or third segment of hind tarsus blackened, in male the blackened parts generally dilated..... 7
Hind tarsi pale, the segments in male not dilated..... 11
7. Two segments of hind tarsus in male and female partly blackened; in males with a pair of long, apically dilated hairs at apex of the three basal segments..... 8
Only one segment of hind tarsus blackened; no such hairs on tarsus of males..... 9
8. Second and third segments of hind tarsus in both sexes partly blackened, in male broadly dilated; almost all of marginal and submarginal cells of wings blackened..... *ornatipes* Johnson.
Apices of basal and second segments of hind tarsus in both sexes blackened, the second in male broadly dilated; fuscous mark on costal margin of wings sometimes broadly interrupted along costa between cross-veins and again, narrowly, between apices of second and third veins,
melanderi Johnson.
9. Costal margin of wing suffused from apex of auxiliary vein to apex of fourth, less distinctly so between cross-veins; second segment of hind tarsus distinctly but not greatly dilated in male; hind tibia without long fine hairs apically on posterior surface..... *houghi* Coquillett.
Costal margin of wing not suffused proximad of a vertical line drawn from outer cross-vein..... 10
10. The spots at apex of second vein and on middle of ultimate section of third almost directly above outer cross-vein, sometimes connected with it; second segment of hind tarsus of male broader than long; hind tibia of male with some long fine hairs on postero-ventral and posterior surfaces apically..... *compedita* Loew.
The spots above referred to distinctly distad of the one on outer cross-vein and not connected with it; second segment of hind tarsus of male distinctly longer than wide; hind tibia of male without long fine hairs apically,
disjuncta Johnson (*similata* Malloch).
11. The entire costal margin of wings broadly brown including the costal and subcostal cells..... *sheldoni* Coquillett.
Costal margin of wing largely hyaline, clouded only from a little before apex of second vein..... 12
12. Thorax with 4 pairs of strong dorsocentral bristles..... 13
Thorax with 3 pairs of strong dorsocentral bristles..... 14

13. Arista plumose; the fuscous spot on middle of ultimate section of third vein of wing separated from the one at apex of second and much distad of the outer cross-vein; hypopygium as in Figure 19— *philadelphica* Macquart. Arista short haired; the spot at middle of ultimate section of third vein connected with the one at apex of second and directly above outer cross-vein; hind femur without preapical anteroventral bristle, *conjuncta* Johnson. Arista short haired; wing markings as in *conjuncta*; hind femur with at least one long preapical anteroventral bristle— *citrifrons* Malloch.
14. Thorax without differentiated acrostichals except the prescutallar pair; base of third vein pale; hind femur without an outstanding preapical anteroventral bristle; hypopygium as in Figure 22— *conjuncta* Johnson. Thorax with well differentiated acrostichal bristles— 15
15. Hind femur of male without an outstanding bristle near apex on anteroventral surface; base of third vein dark brown, much darker than the remainder of vein; two pairs of acrostichals proximad of anterior pair of dorsocentrals, the anterior pair much weaker than the second, *fuscibasis* Malloch. Hind femur with an outstanding bristle near apex on anteroventral surface in both sexes; base of third vein not darker than remainder of vein; one very strong pair of acrostichals proximad of the anterior pair of dorsocentrals proximad of which there are no well-developed bristles, *incerta* Malloch.
16. Wing with both cross-veins broadly infuscated, the infuscation extending well onto the membrane— 17
Wing with the cross-veins not noticeably darker than the others; if so, the infuscation does not extend onto the membrane— 18
17. Male with anteroventral and anterior surfaces of hind tibia and anterior surface of basal segment of hind tarsus with long, soft, erect hairs; the last abdominal sternite with an apical series of short black setulae; hypopygium as in Figure 23— *nubilifera* Malloch. Male without soft, erect hairs on hind tibia and tarsus; last abdominal sternite with a few weak hairs apically— *nubila* Melander.
18. Males— 19
Females— 29
19. Hind femur with a large number of short setulae on basal half of ventral surface; cheek over half as high as eye; hind tibia without erect, soft hairs— *littoralis* Malloch. Hind femur without black setulae on basal half of ventral surface— 20
20. Hind tibia without erect, soft hairs ventrally— 21
Hind tibia with some soft, erect hairs ventrally— 25
21. Claws of mid tarsus unequal in size, the anterior one distinctly larger than the posterior, and peculiarly curved; cheek about half as high as eye; hairs on lower half of back of head and on cheek pale— *harti* Malloch. Claws of mid tarsus equal in length, with the normal curvature— 22
22. Hind femur without a preapical bristle on anteroventral surface; sixth tergite of abdomen fully twice as long as fifth— 23
Hind femur with a distinct preapical anteroventral bristle— 24
23. Arista pubescent; hind femur with some fine, short hairs apically on posteroventral surface— *inaequalis* Malloch. Arista short haired; ventral surfaces of hind femur entirely bare, *nudifemur* Malloch, new species.

24. Eighth abdominal tergite without an obtuse angle caudad of the slender downwardly projecting lateral process; hind femur without erect, soft hairs on posteroventral surface..... *aequalis* Malloch.
 Eighth abdominal tergite with an obtuse angle caudad of the process above referred to—i. e., the process is indistinctly proximad of the posterior lower angle (fig. 27); hind femur with fine, erect hairs on posteroventral surface..... *tenuispina* Loew.
25. Hind femur without a long fine hair close to apex on posteroventral surface; last abdominal sternite with two long tapering processes which are pointed at apices..... *bispina* Loew.
 Hind femur with one or more long fine hairs near apex on posteroventral surface, sometimes the entire surface has a fringe of hairs; apices of processes of last sternite rounded..... 26
26. The lateral extensions of last abdominal sternite much longer than third antennal segment..... 27
 The lateral extensions of last abdominal sternite not longer than third antennal segment..... 28
27. Hind femur with rather dense, long, fine hairs on its entire length posteroventrally; the small spine at base of the slender inner hypopygial forceps long and simple (fig. 28)..... *imitatrix* Malloch.
 Hind femur with sparse fine hairs on posteroventral surface which do not form a complete fringes; the small spine at base of the slender inner hypopygial forceps short, furcate (fig. 25)..... *fratercula* Malloch.
28. Seventh abdominal tergite with a group of short, black, setulose hairs at apex on each side; the fine, erect hairs on hind tibia confined to basal half..... *seticauda* Malloch.
 Seventh abdominal tergite without such hairs; the fine, erect hairs on hind tibia extending almost the entire length of anteroventral surface and present on basal half of postero-ventral..... *cliffiera* Malloch.
29. Hind femur without a distinct preapical anteroventral bristle, *inaequalis* Malloch.
 Hind femur with a distinct preapical anteroventral bristle..... 30
30. Seventh abdominal tergite compressed, almost cylindrical; cheek about or quite half as high as eye; cross-veins usually as pale as the other veins..... 31
 Several abdominal tergite not compressed nor cylindrical; cheek much less than half as high as eye..... 32
31. Hind trochanters with minute black hairs on ventral surface; hairs on back of head and cheeks black..... *littoralis* Malloch.
 Hind trochanters with very few weak pale hairs on ventral surface; hairs on lower half of back of head and cheek yellow, only the two bristles on lower margin posteriorly black..... *harti* Malloch.
32. Prosternum with a few black hairs; penultimate section of fourth vein distinctly over half as long as ultimate..... *bispina* Loew.
 Prosternum bare..... 33
33. Fore femur with two strong posteroventral bristles; cross-veins of wings noticeably darker than other veins..... *tenuispina* Loew.
 Fore femur with three or more posteroventral bristles; cross-veins of wings almost imperceptibly darker than other veins..... *seticauda* Malloch.

LIST OF SPECIES OF THE DISTRICT OF COLUMBIA REGION.

S. aequalis Malloch.—Dead Run, Virginia, June 22, 1915, R. C. Shannon.

S. bispina Loew.—This species has been collected a number of times by various collectors on Plummer Island, Maryland, from May 30 to August 4; and at Beltsville, Maryland, May 25, 1919, McAtee; Dead Run, Virginia, August 3, 1915, V. A. Roberts; and Chain Bridge, Virginia, August 20, 1922, Malloch.

S. cilifera Malloch.—Plummer Island, Maryland, May 9, 1914, R. C. Shannon.

S. citreifrons Malloch.—Beltsville, Maryland, May 21, 1922, Glen Echo, Maryland, June 18, 1922, Malloch.

S. compedita Loew.—Very common; has been collected on dates ranging from May 11 to October 9; in copula June 23; comes to light and visits the flowers of *Castanea pumila* and *Ceanothus americanus*. V. P. I.

S. conjuncta Johnson.—District of Columbia, D. W. Coquillett; Falls Church, Virginia, June 22, N. Banks; Dead Run, Virginia June 6, 1914, R. C. Shannon.

S. disjuncta Johnson.—Frequently taken during a season with May 25 and September 8 at its extremes; there are no records from the upper Potomac Valley where so many of the other species have been collected.

S. fraterna Loew.—Dead Run, Virginia, June 22, July 28, 1915, R. C. Shannon; Cabin John, Maryland, July 31; August 8, Glen Echo, Maryland, July 17, August 8, 28, 1921, July 9, 16, August 6, 22, 1922, Malloch.

* *S. fuscibasis* Malloch.—Dead Run, Virginia, June 22, 1916, June 29, 1915, R. C. Shannon; Falls Church, Virginia, August 7, N. Banks; Plummer Island, Maryland, June 29, September 13, 1914, McAtee; July 31, 1913, R. C. Shannon.

S. houghi Coquillett.—Has been taken a number of times, but does not appear at all common; season June 4 to August 26; in copula June 4, July 14; visits flowers of *Ceanothus americanus* and *Xolisma ligustrina*. V. P. I.

S. imitatrix Malloch.—Washington, District of Columbia, April 17, 1923, E. N. Cory; Beltsville, Maryland, May 21, 1922, Malloch.

* *S. incerta* Malloch.—Common; dates of collection range from June 8 to October 2; comes to light. P. I.

S. nubila Melander.—Arlington, Virginia, June 6, 1914, R. H. Hutchinson.

S. nubilifera Malloch.—Plummer Island, Maryland, June 8, 1914, at light, R. C. Shannon; August 27, 1913, H. S. Barber; Cabin John Bridge, Maryland, June 14, 1913, R. C. Shannon.

S. philadelphia Macquart.—Common; June 9 and September 28 mark the extremes of the season during which it has been collected; comes to light. P. I.

S. seticauda Malloch.—Plummer Island, Maryland, May 30, 1913, R. C. Shannon; June 2, 1912, July 19, 1914, McAtee.

S. tenuispina Loew.—Great Falls, Virginia, June 21; Falls Church Virginia, June 24, N. Banks; Plummer Island, Maryland, May, 1908, William Palmer; May 23, 1914, June 9, 1913, R. C. Shannon; May 24, 1914, June 29, 1913, McAtee; Glen Echo, Maryland, August 2, 1922, Malloch.

DESCRIPTIONS OF TWO NEW SPECIES.

SAPROMYZOSOMA DECEPTOR Malloch, new species.

Female.—Similar to *fraterna* in color. Most closely allied to *notata* Fallen, differing in having the wing markings less distinct, the arista with its longest hairs not noticeably longer than its basal diameter, and the bristles over all not so long and strong.

Length, 3 mm.

Type and one paratype.—White Mountains, New Hampshire (Morrison). Type, Cat. No. 26390. U.S.N.M.

SAPROMYZOSOMA NUDIFEMUR Malloch, new species.

Male.—Agrees with *inaequalis* and its allies in color, but in the two specimens before me there is a dark part on third vein beyond outer cross-vein at the point where the dark spot is present in those forms that have distinct spots on wings. There are no hairs between the acrostichal bristles but otherwise the thorax is as in *inaequalis*. The tergites of abdomen descend so far that it is impossible to distinguish the fifth sternite, but it has evidently no long processes.

Length, 3 mm.

Type and one paratype.—Kaslo, British Columbia, June 23 and July 7 (R. P. Currie). Type, Cat. No. 26391. U.S.N.M.

Genus PERISCCELIS Loew.

This genus is somewhat doubtfully placed in the Sapromyzidae owing to the lack of mesopleural and preapical tibial bristles as well as the presence of but one orbital bristle. The divergent postvertical bristles and peculiar subcostal vein, which is similar to that of the Trypetidae, distinguish the genus from any other in the three families dealt with in this paper, but it is more evidently related to Sapromyzidae than to any other family.

At present it is recorded only from Illinois, where it has been taken on sap exuding from trees, but its small size and habits probably accounts for its absence from collections. Malloch redescribed this genus under the name *Phorticoides* with one species, *flinti* Malloch, which may be synonymous with *annulata* Fallen, a European species.

GENUS TRYPETISOMA Malloch, new genus.

This genus is erected for the reception of *Sapromyza stictica* Loew. Characters as indicated in generic key on page 17.

Genotype.—*Sapromyza stictica* Loew.

T. stictica (Loew).—Originally described from District of Columbia material. For specific characters see key to species of *Sapromyza*, p. 17.

BIBLIOGRAPHY.

COQUILLETT, D. W.

New species of Sapromyzidae.

Can. Ent., vol. 30, no. 11, November, 1898, pp. 277-280.

Describes *Sapromyza magna* from District of Columbia material, p. 279.

New acalyptate Diptera from North America.

Journ. N. Y. Ent. Soc., vol. 10, no. 4, December, 1902, pp. 177-191.

Describes *Sapromyza glauca* from Marlboro, Maryland, p. 177.

LOEW, H.

Diptera Americae septentrionalis indigena. Complete work, 1872.

Describes the following three species from our region:

Sapromyza umbrosa District of Columbia, vol. 1, p. 132.

Sapromyza stictica District of Columbia, vol. 1, p. 133.

Lauzania flaviceps District of Columbia, vol. 2, p. 110.

MALLOCH, J. R.

Some undescribed North American Sapromyzidae.

Proc. Biol. Soc. Wash., vol. 27, pp. 29-42, pl. 2, March 20, 1914.

Records seven species from the vicinity of Washington, District of Columbia, of which six are described as new. One of these *Sapromyza similata* proved to have been previously described as *S. disjuncta* Johnson.

Some new North American Sapromyzidae (Diptera).

Can. Ent., vol. 52, nos. 6-7, June-July, 1920, pp. 126-128.

Sapromyza fuscibasis, new species is described from Plummer Island, Maryland.

Some new genera and species of Lonchaeidae and Sapromyzidae (Diptera.)

Proc. Ent. Soc. Wash., vol. 25, no. 2, February, 1923, pp. 45-53.

Eight new species from this region are described.

MELANDER, A. L.

A synopsis of the Sapromyzidae.

Psyche, vol. 20, no. 2, April, 1913, pp. 57-82, pl. 3.

Records five species from the District of Columbia.

EXPLANATION OF PLATES.

PLATE 1.

Structural details of Lonchaeidae and Sapromyzidae.

FIGURE 1. *Lonchaea polita*, hypopygium of male, ventral view, one side.

2. *Lonchaea winnemana*, head, dorsal view.

3. *Lonchaea nudifemorata*, hypopygium of male, ventral view, one side.

4. *Lonchaea winnemana*, wing.

5. *Minettia americana*, hypopygium of male, ventral view, one side.

6. *Minettia americana*, same, dorsal view, one side.

FIGURE 7. *Minettia americana*, same, lateral view.

8. *Minetta obscura*, hypopygium of male, ventral view, one side.
9. *Minetta lupulina*, hypopygium of male, ventral view, one side.
10. *Sapromyza serrata*, hypopygium of male, side view.
- 10a. *Sapromyza serrata*, inferior forceps.
11. *Sapromyza obtusilamellata*, hypopygium of male, ventral view.
12. *Sapromyza obtusilameellata*, same, rear view.
13. *Sapromyza annulata*, hypopygium of male, rear view.
- 13a. *Sapromyza annulata*, inferior forceps.
14. *Sapromyza pictiventris*, hypopygium of male, rear view.
- 14a. *Sapromyza pictiventris*, inferior forceps.
15. *Sapromyza quadrilineata*, hypopygium of male, rear view.
- 15a. *Sapromyza quadrilineata*, inferior forceps.

PLATE 2.

Hypopygia of Sapromyzidae.

FIGURE 16. *Camptoprosopella verticalis*, genitalia of female, ventral view, one side.

17. *Camptoprosopella verticalis*, hypopygium of male, side view.
18. *Sapromyzosoma fraterna*, hypopygium of male, side view.
19. *Sapromyzosoma philadelphica*, hypopygium of male, side view.
20. *Sapromyzosoma fraterna*, inferior forceps of male.
21. *Sapromyzosoma fraterna*, hypopygium of male, ventral view, one side.
22. *Sapromyzosoma conjuncta*, hypopygium of male, side view.
23. *Sapromyzosoma nubilifera*, hypopygium of male, side view.
24. *Sapromyzosoma pernotata*, inferior forceps.
25. *Sapromyzosoma fratercula*, hypopygium of male, side view.
26. *Sapromyzosoma pernotata*, hypopygium of male, side view.
27. *Sapromyzosoma tenuispina*, superior forceps.
28. *Sapromyzosoma imitatrix*, hypopygium of male, side view.

ADDENDUM.

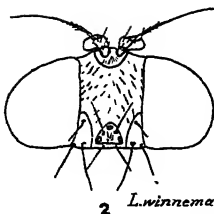
After the manuscript of this paper was sent to the press a paper by Dr. A. H. Sturtevant appeared in which he records *Periscelis annulata* Fallen from Alabama, South Dakota, and New Mexico.*

In the same paper he describes a new genus and species, *Sphyroperiscelis wheeleri* Sturtevant, from Massachusetts. This genus differs from *Periscelis* in having the frons much wider, about three times as wide as either eye, the antennal bases separated by about as great a distance as either is from eye, not rather closely approximated, the front of frons flattened, and the outer cross-vein of wing lacking. We have not seen the genus.

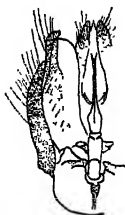
* Amer. Mus. Novit., No. 76, p. 1, May 21, 1923.



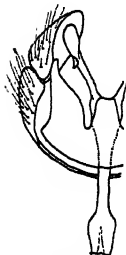
L. polita 1



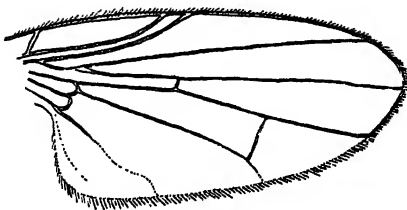
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3 *L. nudimorata*



5 *Mamericana*

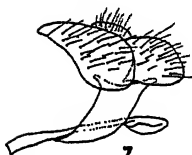


4 *L. winnemana*



Mamericana

6



Mamericana



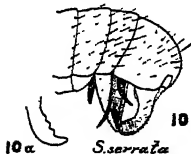
Mabseura

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M. lupulina

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S. serrata

10 α



Sabtusiella mellata

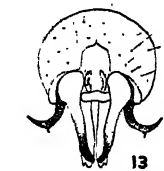
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14

Spicivantis

14 α



Sannulata

13 α



Sabtusiella mellata

12



S. quadrilineata

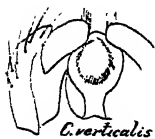
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15 α

STRUCTURAL DETAILS OF LONCHAEIDAE AND SAPROMYZIDAE

FOR EXPLANATION OF PLATE SEE PAGES 25 AND 26



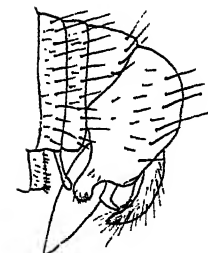
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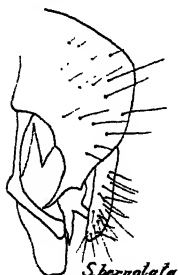
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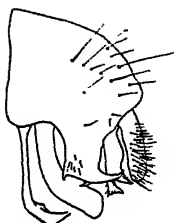
20



S. subulifera 23



26



S. fraterna

18



S. fraterna

21



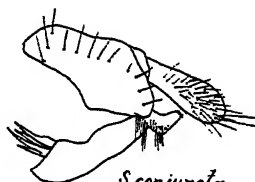
S. pernotata

24



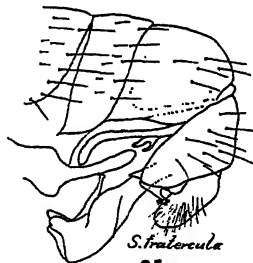
S. philadelphia

19



S. conjuncta

22



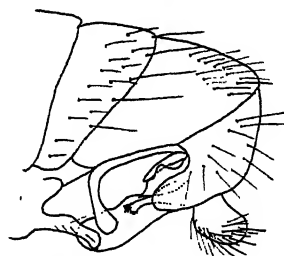
S. fratercula

25



S. tenuispina

27



S. similatrix 28

HYPOPYGIA OF SAPROMYZIDAE

FOR EXPLANATION OF PLATE SEE PAGE 26

NEMATODE PARASITES OF THE BRAZILIAN LAND-TORTOISE, *TESTUDO DENTICULATA*.

RESULTS OF THE MULFORD BIOLOGICAL EXPLORATION.—
HELMINTHOLOGY.

By EDWARD A. CHAPIN,
Of the United States Department of Agriculture.

Among the numerous vertebrates brought to this country by the Mulford Expedition to northern South America were two specimens of the large land tortoise, *Testudo denticulata*. These animals died shortly after their introduction into the National Zoological Park and through the kindness of the United States National Museum authorities, the author was permitted to examine the viscera for parasitic worms. Four species of nematodes were found, three of which appear to be new to science. Two of the species fall into the Strongyloidea, one of them representing a new genus; of the remaining two, one belongs in the Ascaroidea and the other in the Oxyuroidea.

Superfamily STRONGYLOIDEA.

Family STRONGYLIDAE.

SAURICOLA, new genus.

Generic diagnosis.—Strongylidae; Strongylinae, adults about 10 mm. long, head about 140 μ in diameter. Buccal capsule small, shallow. Capsule surrounded by two leaf-crowns. Cuticle surrounding mouth forming a short mouth collar, limited behind by an annular constriction. Six circumoral papillae. Lateral papillae stout, apparently with terminal organ. Submedian dorsal and ventral papillae more slender, projecting beyond surface of cuticle, sharply angulate before apex in lateral view. Excretory pore behind the esophagus. Cervical groove and papillae absent. Nerve ring at posterior third of esophagus. Esophagus cylindrical, about twice as long as thick. Bursa of male short, dorsal, and lateral portions of membrane not separated, preanal bulla present, enclosing

two slender prebursal papillae. Dorsal ray quadridigitate, externo-dorsal slender, postero-lateral and medio-lateral stout, subequal, externo-lateral more slender, ventrals subequal, stout, separated to base. Spicules long, slender, simple, gubernaculum small, simple. Vulva just before anus, vagina short, ovejector, and sphincter muscles not developed, uteri two and convergent. Eggs oval with thin shells, not embryonated within uterus.

Genotype.—*Sauricola sauricola*, new species.

As may be seen from the above diagnosis, this genus is rather closely related to the oesophagostomes, or nodular worms, from which it differs in the very short and thick esophagus, the absence of cervical papillae, the position of the excretory pore and the convergent uteri without muscular ovejectors. Apparently, this worm does not produce nodules in the intestine of the host.

SAURICOLA SAURICOLA, new species.

Specific diagnosis.—*Sauricola*; body cylindrical, tapering slightly at extremities. Cuticle about 30μ thick, with very coarse transverse striae. Mouth short, chitinous framework of buccal capsule 100μ in outside diameter, walls 15μ thick and 22μ high. Outer leaf crown of short and broad elements, inner crown of long slender acutely pointed blades which project beyond the opening of the mouth. Eighteen elements in each crown (fig. 1). Lateral papillae stout, each with an internal process at apical third. Esophagus 300μ long, (fig. 2), 170μ thick, walls in anterior part thickly studded with stout conical teeth, nerve ring 180μ behind the buccal capsule. Excretory pore 570μ back of mouth collar. Intestine composed of two layers, a thin inner chitinized layer 5μ thick and a thick outer muscular layer of varying thickness, averaging 50μ in thickness. Lumen of intestine of large diameter, about 50μ .

Male.—Tips of the inner of the four subdivisions of the dorsal ray reach the edge of the bursal membrane. Ventral rays separate near their origin (fig. 3). Externo-lateral arises near base of the combined medio- and postero-laterals. Separation of medio- and postero-laterals occurs slightly beyond apical third of length. There is a dorsal process from the main trunk just before the separation of the lateral rays, as in *Oesophagostomum radiatum*. Externo-dorsal arises near base of dorsal trunk, which bifurcates at the middle of its length. Spicules (fig. 4) slender, equal, 2.36 mm. long. Gubernaculum 68μ long.

Female.—Similar to male in size and general conformation. Posterior extremity of worm (fig. 5) mucronate, external opening of alimentary canal opens 115μ in front of the extreme apex of worm, external cuticle extends 140μ into the worm to the true anus. Vulva opening 140μ in advance of the external opening of the intestine.

Vagina 1.5 mm. long, muscular but without muscular ovejector or sphincter. Uteri convergent, soon parallel, extending forward to just in front of the middle of the worm. Ovaries extending between the end of the uteri and the excretory pore. Eggs (in uterus) $128\mu \times 57\mu$.

Host.—*Testudo denticulata* (*Testudo tabulata*).

Location.—Intestine (large?).

Locality.—Brazil, Pará.

Type.—U. S. N. M. Helm. Coll. No. 25446 in glycerine. Paratypes (part in glycerine, part in 70 per cent alcohol), Cat. No. 25394; also in the British Museum.

Genus DELETROCEPHALUS Dies.

DELETROCEPHALUS VARIABILIS, new species.

Specific characters.—*Deletrocephalus*; length¹ up to at least 8 mm., form cylindrical, tapering sharply at anterior end, cuticle with widely spaced transverse striae, mouth collar distinct, circumoral papillae six, laterals about 20μ long, apical half cylindrical and much smaller in diameter than basal half, submedian about 10μ long, simple. Buccal capsule (fig. 6) surrounded by a chitinous ring; 10μ deep by about 40μ across. Leaf crown single, composed of eighteen slender leaves, each leaf with conspicuous angular bend at about the middle. Esophagus about 370μ long, slightly enlarged posteriorly, lumen with three longitudinal rows of chitinous bosses, extending through the anterior three-fourths of the length. Nerve ring just in front of the middle of the esophagus. Excretory pore at or just behind the esophago-intestinal valve. Cervical papillae conspicuous, about one-fourth length of esophagus behind its posterior extremity. Intestine slender, with a few small caecal dilations towards the posterior end, especially in the female.

Male.—Bursa (fig. 7) feebly trilobed, dorsal ray normally divided into three trunks, each of which may, and usually does, bifurcate. Externo-dorsal rays slender, arising about middle of dorsal trunk. Trunk of lateral rays stout, trifurcating at about middle. Postero-lateral and externo-lateral rays stout, medio-lateral more slender and joined at its base with the externo-lateral, tips of medio-lateral and externo-lateral approach one another. Ventrals similar and parallel, their tips approximate. Prebursal papillae absent. Spicules (fig. 8) slender, similar, 1.54 mm. long, each with a lateral ala which commences just behind the apex and travels in a long spiral about the spicule, completing three-fourths of one complete circuit.

¹ No mature females available for study.

Female.—Anus 86μ before the end of the short conical, conspicuously annulate tail (fig. 9). Vulva 32μ before anus. Vagina strongly muscular, 180μ long. Uteri two, convergent, running parallel and forward nearly to excretory pore.

Host.—*Testudo denticulata*.

Location.—In intestine.

Locality.—Brazil, Pará.

Types.—U. S. N. M., Helm. Coll. No. 25445 in glycerine. Paratypes, Cat. No. 25398 (part in glycerine, part in 70 per cent alcohol); also in the British Museum.

Superfamily ASCAROIDEA.

Family ASCARIDAE.

Genus ANGUSTICAECUM Baylis.

ANGUSTICAECUM BREVISPICULUM, new species.

Specific characters.—*Angusticaecum*; length up to 120 mm., greatest diameter 3 mm. Head (figs. 10, 11) 0.5 mm. in diameter, lips twice as broad at base as high, somewhat rounded. Cuticle transversely striate at intervals of 6μ . Intestinal caecum slightly more than half length of and about one-fourth as thick as the esophagus. Esophagus one fifteenth of the total length. Posterior end of worm mucronate. Anus subterminal.

Male.—Spicules (fig. 12) subequal in length (1.4 and 1.3 mm.), one much thinner (28μ) than the other (85μ). Opening of cloaca about 150μ in front of the posterior extremity. Behind the cloaca there are five pairs of papillae and two single papilliform structures, these last probably glandular. Directly in front of the cloaca there is a transverse sinuous line of five papillae and, extending anteriorly from the second and fourth papillae of this row are two files of papillae, sixteen in each.

Female.—Vulva a transverse slit just before the middle. Vagina about 4 mm. long, uteri double and convergent, reaching nearly to posterior extremity of worm, ovaries intricately coiled about the uteri throughout their length. Anus about 1 mm. in front of the tip of the tail. Eggs 114–142 by $71\text{--}85\mu$ with thick smooth shell.

Host.—*Testudo denticulata*.

Location.—Intestine.

Locality.—Brazil, Pará.

Types.—U. S. N. M., Helm. Coll. No. 25406 in 70 per cent alcohol. Paratypes, Cat. No. 25407, in 70 per cent alcohol.

Angusticaecum holopteryum (Rudolphi) was originally described as a parasite of the green sea turtle, *Chelonia mydas*, and as having

the head and body alate. The present species comes from a land tortoise and is without alae. Whether the nematode found in *Testudo graeca* of Europe is the same as *Ascaris holoptera* Rudolphi is another question but the great difference in the habits of the hosts would lead one to suspect a misidentification.

Superfamily OXYUROIDEA.

Family OXYURIDAE.

Genus LABIDURIS Schneider.

LABIDURIS GULOSA (Rudolphi).

Syn.: *Labiduris zschokkei* Linstow.

Many hundred specimens of a worm which I refer to the above species were collected from the intestine (colon?) of *Testudo denticulata*. An examination of the specimens shows a great range of variation in the length of the spicules, length of the acute tail and position and number of the preanal papillae. In ten male specimens selected at random, the spicules measured from 0.48 mm. to 0.60 mm. The acute portion of the tail may be as short as the distance from the opening of the cloaca to the base of the tail or more than twice that length. In front of the cloaca there may be as many as five papillae in each of the submedian rows with either none, one or two on either side of the rows. There are, however, usually three papillae in each submedian row.

The points of difference between *L. gulosa* (Rudolphi) as described by Schneider and *L. zschokkei* Linstow, as brought out in von Linstow's original description are (1) tail long in *L. gulosa* and short in *L. zschokkei* and (2) one papillae outside of either submedian row in the former, two in the later. As these differences do not appear to hold in a large series, I am placing von Linstow's species in synonymy. Both species were described from *Testudo tabulata*, which equals *Testudo denticulata*.

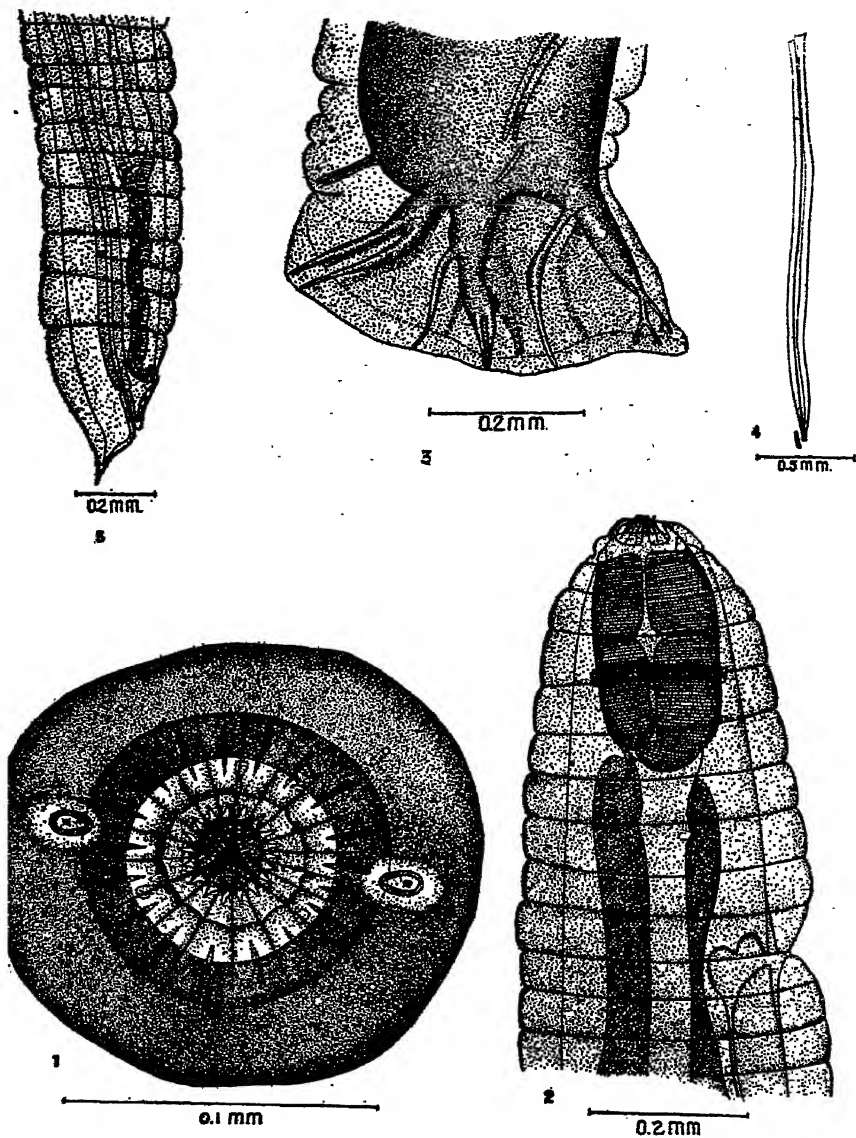
EXPLANATION OF PLATES.

PLATE 1.

- Fig. 1. *Sauricola sauricola*, new species. Front view of head.
 2. " " " " Lateral view of anterior end.
 3. " " " " Posterior end of male.
 4. " " " " Spicules and gubernaculum of male.
 5. " " " " Posterior end of female.

PLATE 2.

- Fig. 6. *Deletocephalus variabilis*, new species. Lateral view of anterior end.
 7. " " " " Posterior end of male.
 8. " " " " Extremities of spicule.
 9. " " " " Posterior end of female.
 10. *Angustioaecum brevispiculum*, new species. Front view of head, dorsal
 lip slightly displaced.
 11. " " " " Lateral view of head.
 12. " " " " Posterior end of male.



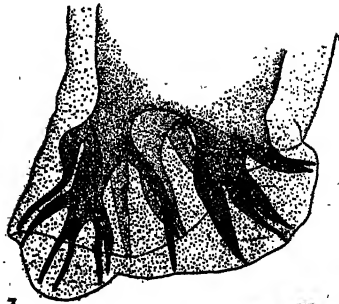
SAURICOLA SAURICOLA, NEW SPECIES.

FOR EXPLANATION OF PLATE SEE PAGE 8.



11

0.2 mm.



7



10

0.2 mm.



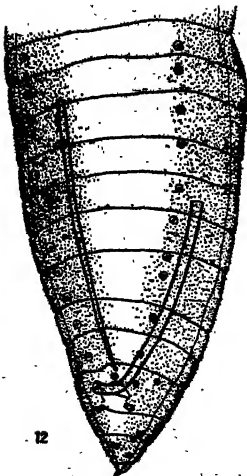
6

0.1 mm



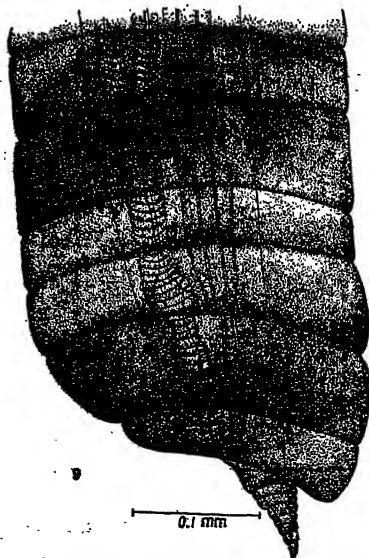
8

0.1 mm



12

0.5 mm.



9

0.1 mm

DELETROCE PHALUS VARIABILIS, NEW SPECIES, AND ANGSTICAECUM BREVISPICULUM, NEW SPECIES.

FOR EXPLANATION OF PLATE SEE PAGE 6.

A REMARKABLE NEW GENUS AND SPECIES OF MERMITHID WORMS FROM JAMAICA.

By G. STEINER

Of the Bureau of Plant Industry, United States Department of Agriculture.

On September 29, 1922, the Federal Horticultural Board, through the kindness of E. R. Sasscer, submitted five Mermithid specimens taken at Philadelphia, Pa., from soil about plant cuttings from Jamaica by Inspector C. A. Davis on September 25, 1922. These five Mermithids all belong to the same species, which is new to science, and is the representative of a new genus, remarkable in several respects. Our knowledge of the Mermithidae is still very limited. This family of parasitic nemas is of high economic importance and much more interest should be taken in it.

ALLOMERMIS,¹ new genus.

Diagnosis.—A genus of the family of Mermithidae with only four head papillae, with a mouth opening lying ventrad behind the head papillae, with amphids (lateral organs) near the front of the head-end and so lying farther forward than the head papillae, with a single dorsal suspensory or retractory muscle on the oral part of the oesophageal tube, with a vagina bent in a transverse plane of the body, with a pair of spicula and the cuticle with cross-fibers.

Type species.—*Allomermis trichotopson*,² new species.

The genus is closely related to *Paramermis*, but differs from it in having only four head papillae, whereas *Paramermis* has six; it differs also in having in the male two spicula while *Paramermis* has only one. The presence of cross-fibers in the cuticle is also a distinctive character since no *Paramermis* hitherto described has them. The genus *Pseudomermis*, which has the same number of head papillae as *Allomermis* (only four), differs in the position of the amphids. In *Pseudomermis* they have the normal position behind the lateral papillae and the mouth opening has its normal place on the front of the head-end.

Therefore the new genus *Allomermis* seems to be well separated and distinctly different from any other hitherto described Mermithid genus. As to relationship, it stands next to *Pseudomermis*. Considering the fact that *Allomermis* has the mouth opening and the

¹ αλλος = otherwise, differently.

² τριχωτος = hairy, ψου = egg.

amphids shifted as in some forms of *Paramermis*, one might regard it as being closer to this genus, but the paired spicula and the number (four) of the head papillae speak against such a relationship.

ALLOERMIS TRICHOTOPSON, new species.

Plates 1-2.

Number of specimens.—3 females, 2 males.

Habitat.—Soil, Jamaica.

Measurements.—Formula of Cobb:

	Pharynx.	Nerve-ring.	Neck.	Vulva.	Posterior end of fat body.	
Female:	?	1.9	?	61.0	98.4	12 mm.
	?	0.9	?	1.2	.8	
					Male sex opening.	
Male:	?	2.5	?	50	98.0	9.7 mm.
	?	1.1	?	1.5	1.3	

Formula of de Man:

	Female	Male
α —	83.3	66.6
β	?	?
γ —	76.0	50.0

Length of female No. 2—11 mm.

Length of female No. 3—16 mm.

Length of male No. 2—11 mm.

The size of this species if compared with that of other Mermithids is rather small. The cuticle was detached from the hypodermis and so its thickness could not be exactly measured. On the surface is a layer of cross-fibers.

The hypodermis has apparently eight longitudinal chords,³ of which the lateral, measured on the surface, are about 42 microns wide, the dorso-medial about 8 microns, the ventro-medial and the four submedial 3-4 microns; it seemed that all of them are about equally distant from each other.

The head-end is bluntly rounded as shown in Figures 1-4. Its structure is very characteristic. The mouth opening is situated some distance behind the head papillae and has therefore a decidedly ventral position. I know no other nema with such remarkable location of the mouth opening. Some species of the genus *Paramermis* have a shifted mouth opening, but there it still lies between the anterior extremity and the circle formed by the papillae. Only in *P. gastrostoma*, a species described earlier by the writer, and in *P. hempeli*, described recently by Micoletzky, and closely related to *P. gastrostoma*, is the mouth opening situated on the same level with the head papillae.

³ Proposed by Doctor Cobb for use in place of the rather unsatisfactory term "longitudinal fields"; it may be used in the same way as the German term "Längswillste."

But this is not the only peculiarity in the structure of the head-end. Whereas the mouth opening is shifted backward and down from the top of the head, two other organs, namely the amphids, are shifted forward and nearer to the top of the head. These amphids lie throughout the nematode class laterally behind the head papillae. As far as I know only the above-mentioned *Paramermis*, species which have a shifted mouth opening, have also shifted amphids; in these species they are found on the same level with the head papillae or even a little farther forward. But *Allomermis trichotopson* represents in this transformed arrangement the extremest case, the mouth opening located farthest caudad, the amphids, farthest forward. There are four submedian head papillae situated at the normal place.

The mouth opening is a rather narrow, thin-walled channel through the cuticle and lower subcuticle layers, leading to the beginning of the cutinized esophageal channel (fig. 1). The latter at its beginning is dorsally attached by a rather strong muscle passing obliquely caudad and dorsad. This muscle certainly functions in a double way, as suspensory muscle for the end of the esophageal channel and as a retractor muscle. A protractor muscle is apparently not needed because of the elasticity of the skin, the exoskeleton.

The amphids are, as shown in Figure 6, pouch-like organs; the bottom of the pouch is connected with a nerve and with what seems to be a glandular cell; from the bottom of the pouch, which is perforated, rise the terminals, thread-like end organs of the nerve, which are perhaps chemical in function.

There is a difference between the amphids of the male and female in so far as those of the male are larger; such a sexual dimorphism is not uncommon among Mermithids.

The length of the esophageal tube could not be determined, but it probably runs down to near the vulvar opening; I could follow it near to the midst of the anterior uterus.

The so-called fat body is filled with rather small globules so that the cell walls even in the cleared specimens could not be distinctly seen. Opposite the vagina the fat body was separated, perhaps to give space to the sexual organs.

The vulva is a cross-fissure (fig. 7) leading into a tubular sigmoid vagina bent in a transverse plane of the body. Numerous, chiefly circular, but also longitudinal, muscle fibers form the wall of the vagina. This latter opens at right angles into the uteri which are outstretched forward and backward. The structure of the two ovaries and their outlets could not be seen, but each ovary is bent backwards and its end may lie at half the distance to the vulva. A great number of very typically formed eggs were in the uteri. They were spherical, had a rather strong shell covered with numerous

hair-like processes, or perhaps even prickles (fig. 9). There is no other *Mermis* known as yet with such eggshell appendages.

The female tail end is represented in figure 10; it has the same blunt ending as that of the male (fig. 11); the female specimen whose tail end is sketched is slightly intersexual as shown by the presence of male papillae near the end.

The male tail end is shown in figures 11 and 12. There are two spicula, rather short, slightly curved; the retractor muscles are to be seen on figure 12 and the protractores on figure 11. The male papillae are arranged in three double series, the longest ventro-medial, the two others submedial (fig. 12).

Type.—U.S.N.M., Helminthological Collections No. 26078; paratypes No. 26079.

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MICOLETZKY, H., Mermithiden und freilebende Nematoden aus dem Grundschlamm des Attersees in Oberösterreich. Zool. Anz., vol. 55, p. 240, 1923.

EXPLANATION OF PLATES.

PLATE 1.

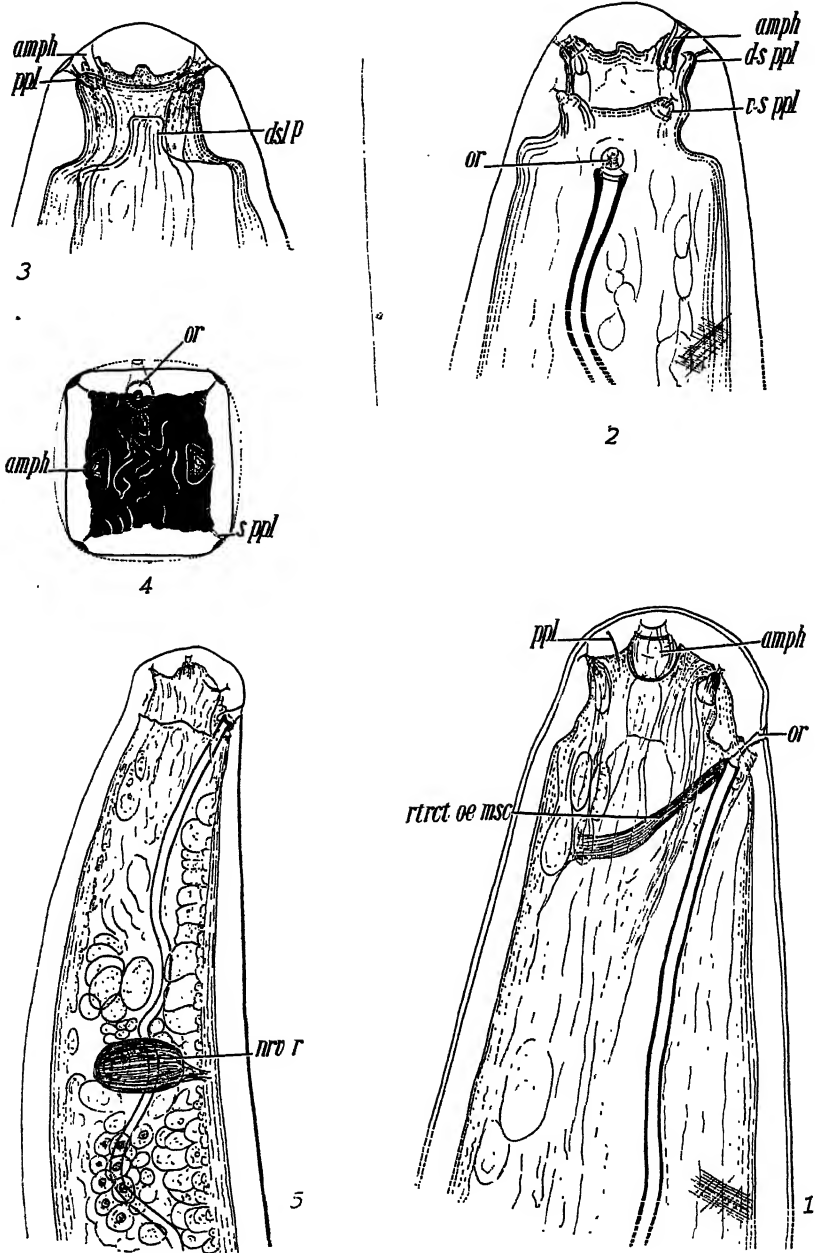
Allomermis trichotopson, new species.

- FIG. 1. Lateral view of a male head end; *amph*, amphid; *or*, mouth opening; *ppl*, small supplementary papilla between dorso-submedial papilla and amphid; *rtret oe msc*, retractor and suspensor muscle of the oral end of the oesophageal tube.
2. Ventral view of the head end; *amph*, amphid; *ds ppl*, dorso-submedial papilla; *vs ppl*, ventro-submedial papilla; *or* mouth opening.
3. Dorsal view of the head end; *amph*, amphid; *dsl p*, thickening of the subcutaneous tissue of the dorsal side; *ppl*, dorso-submedial papilla.
4. Frontal view of the head end; *amph*, amphid; *or*, mouth opening; *s ppl*, submedial papilla.
5. Head end of a female specimen; *nrr r*; nerve ring: compare the somewhat smaller amphid of this female with the amphid of the male on Fig. 1.

PLATE 2.

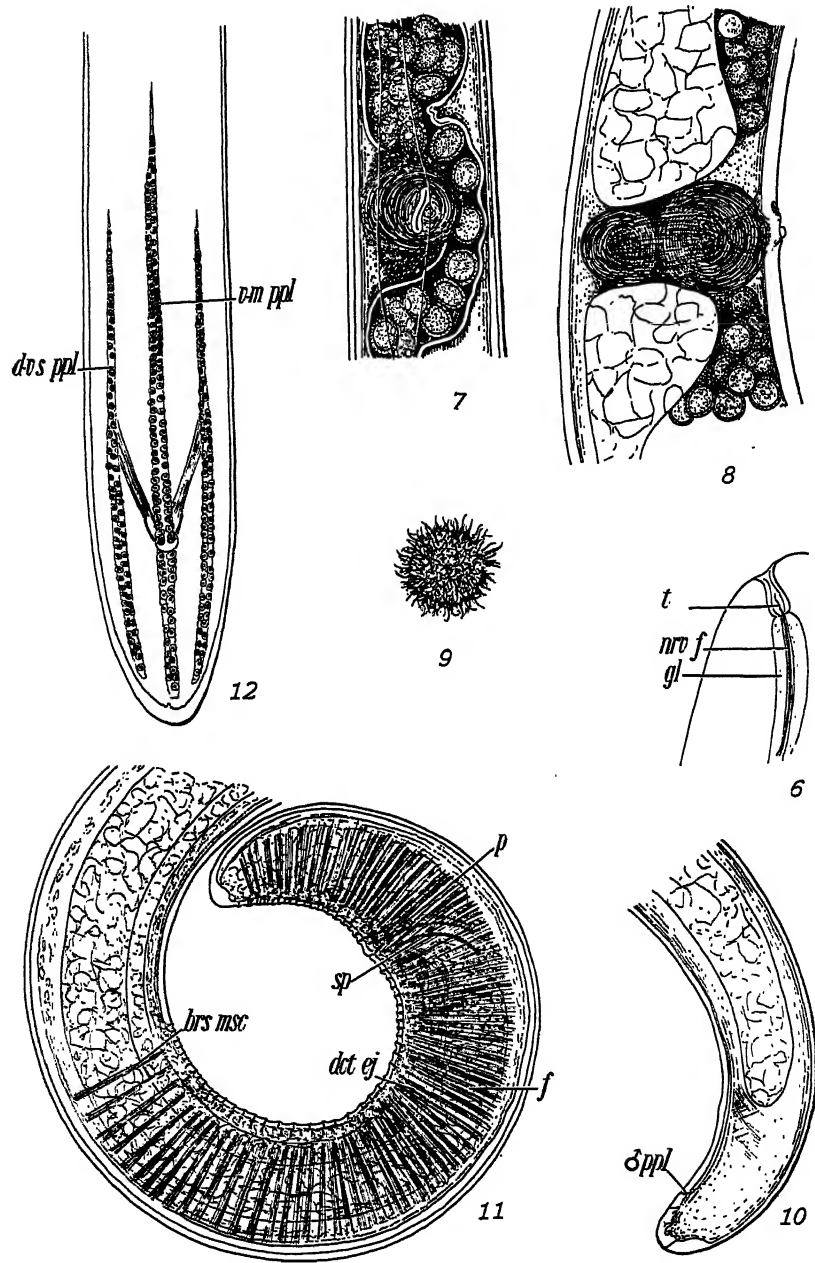
Allomermis trichotopson, new species.

- FIG. 6. Schematic sketch of the amphid; *gl*, glandular cell; *nrr f*, nerve fiber: *t*, terminal.
7. Ventral view of the vulva, the vagina, and the uteri.
8. Lateral view of the vulvar section of the body.
9. Egg.
10. Female tail end, slightly intersexual; *ppl*, male papillae.
11. Lateral view of the male tail end; *brs msc*, bursal muscle; *det ej.* ductus ejaculatorius; *f*, fat body; *p*, protractor spiculi; *sp*, spiculum.
12. Ventral view of the male tail end; *vm ppl*, ventro-medial series of male papillae; *d vs ppl*, *vs ppl*, dextero-ventro-submedial series of male papillae.



A NEW GENUS OF MERMITHID WORM

FOR EXPLANATION OF PLATE SEE PAGE 4



A NEW GENUS OF MERMITHID WORM

FOR EXPLANATION OF PLATE SEE PAGE 4



HISTORY OF MEDICINE EXHIBITS. EAST GALLERY

FOR DESCRIPTION OF PLATE SEE PAGE 2

THE MAGIC, PSYCHIC, ANCIENT EGYPTIAN, GREEK, AND ROMAN MEDICAL COLLECTIONS OF THE DIVI- SION OF MEDICINE IN THE UNITED STATES NA- TIONAL MUSEUM

By CHARLES WHITEBREAD

Assistant Curator, Division of Medicine, United States National Museum

INTRODUCTION.

The origin of the *materia medica* collection of the United States National Museum dates back to 1881. In 1882 the drug collection which had been exhibited at the Centennial Exposition at Philadelphia in 1876 was transferred to the Museum by the Department of Agriculture. For a time the efforts of the section of *materia medica* were confined almost exclusively to procuring authentic specimens of medicinal materials. Some years later the scope of the section was enlarged to include exhibits visualizing the history of the healing art, and in 1898 the more comprehensive name of division of medicine was substituted for the "section of *materia medica*" theretofore used. The scope of activities of the division was again enlarged in 1916, this time to include the history of pharmacy, public hygiene and sanitation, and the division, which up to that time had been administered under the department of anthropology, was made a unit of the department of arts and industries.

The *materia medica* collection has served the purpose of giving the general public an easy reference to specimens of "official" medicine and has afforded students of medicine and pharmacy the opportunity of studying this subject in its various details. The subjects of history of pharmacy, public hygiene and sanitation, because of their comparatively recent addition to the activities of the division, have not progressed to the same degree of perfection as the *materia medica* and history of medicine collections, but with the cooperation of the various government departments and outside agencies interested in these subjects, extensive plans for their development are now under way.

This paper has been prepared to meet the demand for labels and information concerning the historical medical collections, and to

make the exhibits of value not only to those who find it convenient to pass through the exhibition halls, but to many others. In endeavoring thus to carry into effect the purpose of the Smithsonian Institution, "the increase and diffusion of knowledge among men," it has been considered preferable to describe small groups of related exhibits in detail rather than to compile a larger and more complete list which would necessarily be limited to very meager information.

The collections herein described are located on the east gallery, Arts and Industries Building. Plate 1 gives a view of one side of the gallery. Plates 2, 3, 4, and 5 show the arrangement of the separate exhibits.

EARLY THEORIES OF DISEASE.

Disease, a malevolent spirit, assuming material form either animate or inanimate, attacking the victim with or without provocation. Primitive.

Disease, a spirit, acting at the suggestion of a human enemy possessing supernatural powers. (Sorcery, witchcraft, conjury.) Savage and half-civilized people.

Disease caused by the angered spirits of the dead, either men or animals, or even plants. Savage and half-civilized people.

Disease, a punishment, inflicted by an offended deity. Ancient.

Disease due to the influence of the planets or other heavenly bodies. Astrology.

Disease due to a disturbance in the relative proportions or distribution of the fluids, or "humors" of the body, namely, blood, phlegm, black bile, and yellow bile. (Hippocrates, Galen.)

ARRANGEMENT OF EXHIBITS.

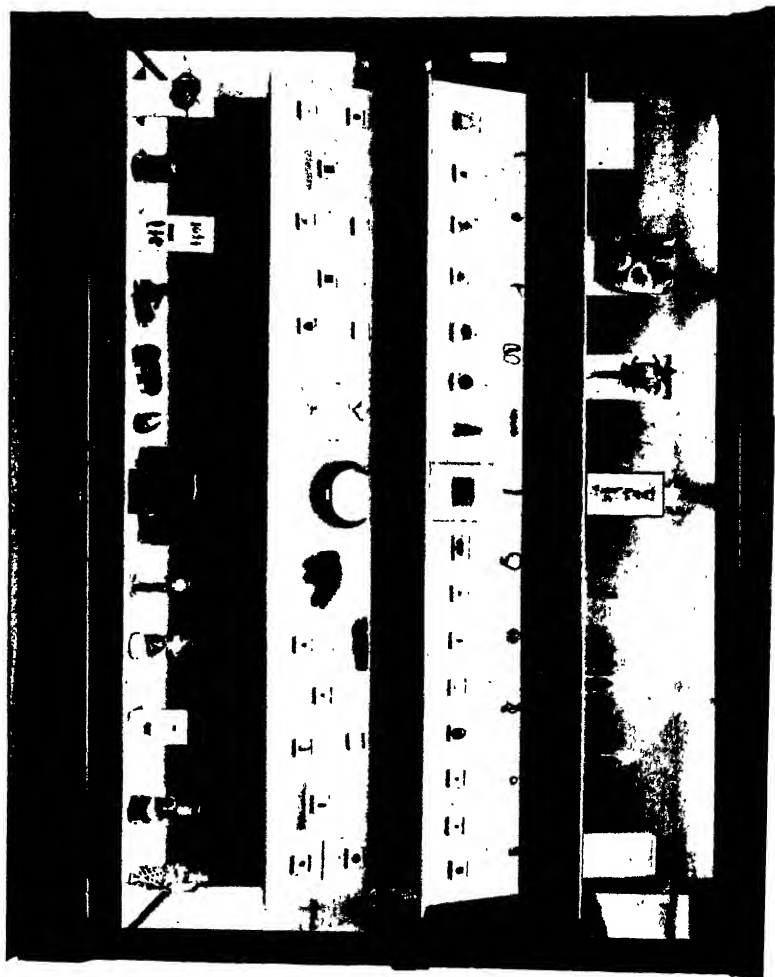
Magic medicine: Exorcism; invocation; incantation; amulets and charms; talismans; fetiches; transference of disease; signatures; the evil eye; sympathetical cures.

Psychic medicine: Music; metallotherapy; laying on of hands; royal touch; hypnotism.

Pharmacological medicine: Egyptian medicine; Greek and Roman medicine.

MAGIC MEDICINE.

Magic is the "pretended art of producing supernatural effects by bringing into play the action of supernatural or spiritual beings, of departed spirits, or of the occult powers of nature." Its application to the treatment of disease is magic medicine. The agents may be



MEDICAL EXHIBITS--MAGIC MEDICINE

FOR DESCRIPTION OF PLATE SEE PAGE 2

gods or demons, disembodied spirits of men, animals, plants, or minerals, or may be occult influences residing in, or exerted through, certain natural objects. These agents or influences are brought into action by invocations, sacrifices, incantations, and ceremonials of various kinds.

In so far as these magic arts produce physiological and remedial effects, which they undoubtedly sometimes do, they might be classified under the head of psychic or mind medicine, the mental state aroused by a firm belief in their efficacy causing modifications of physiological function and even tissue change.

Magic medicine is especially characteristic of the earlier stages of human development, when all natural forces were personified, and disease and death believed to be caused by malignant spirits.



FIG. 1.—INDIAN MEDICINE MAN'S RATTLE.

The collection only outlines the subject of magic medicine, which covers a wide field for investigation and illustration.

Exorcism.—Casting out evil spirits by religious or magic formulas or ceremonies. A mode of healing the sick as old as the history of medicine. Has been practiced by the people of all ages and in all stages of civilization. It is still an authorized religious ceremony.

Indian medicine man's rattle.—Made of wood, covered with buckskin in imitation of a turtle. Used in the ceremonies of exorcism (fig. 1). Cat. No. 165,848, U.S.N.M.

Animal mask.—Worn by Indian medicine man in the practice of exorcism (fig. 2). Cat. No. 67,957, U.S.N.M.

Invocations.—Prayers for the assistance of disembodied spirits of animals or men, or the mythical gods and heroes, or of the Deity, commonly used as an accompaniment of other remedial measures, are among the oldest, most persistent, and most widely diffused of the means employed for the cure of disease.

Isis.—One of the principal deities of ancient Egypt. The following prayer was used while preparing medicines, and before taking the same:

May Isis heal me, as she healed Horus of all the ills inflicted upon him when Set slew his father Osiris. O Isis, thou great enchantress, free me, deliver me from all evil, bad and horrible

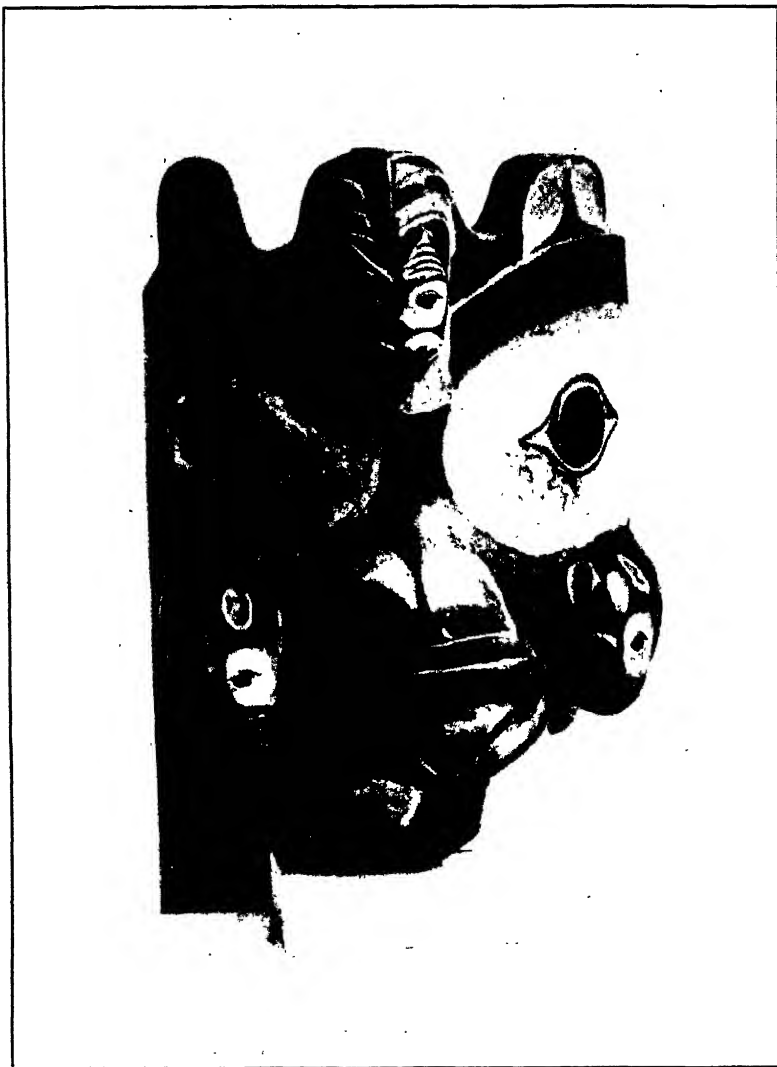


FIG. 2.—ANIMAL MASK.

things, from the God and Goddess of evil, from the God and Goddess of sickness, and from the unclean demon who presses upon me, as thou didst loose and free thy son Horus. Baas's History of Medicine.

Indian invocations. Fern roots.—For the cure of rheumatism. The common belief of the Indians regarding rheumatism is that it is caused by the

revengeful spirits of slain animals, especially deer. The disease can only be driven out by some more powerful animal spirit. The doctor invokes the aid of the Red Dog of the East, the Blue Dog of the North, the Black Dog of the West, the White Dog of the South, and finally the White Terrapin of the Mountain, in separate prayers. While reciting the prayers the doctor rubs the afflicted part with a warm solution of fern roots and at the end of each appeal he blows once upon the part. Cat. No. 143,087, U.S.N.M.

Incantations.—Magical words said or sung. A mode of treatment employed by the Persians and Greeks, and transmitted by tradition down to the "folk-medicine" of the present day.

Abracadabra.—This was one of the most famous of the ancient incantations employed in medicine. Its mystic meaning has been the subject of much ingenious investigation, but even its derivation has not been agreed upon. The first mention of the word is found in the poem "De Medicina Praecepta Saluberrima," by Quintus Serenus Samonicus, a noted physician in Rome in the second and third centuries. In addition to being used as an incantation it was used as an amulet or charm. "Write several times on a piece of paper the word 'Abracadabra,' and repeat the words in the lines below, but take away

A B R A C A D A B R A	a b r a c a d a b r a	
A B R A C A D A B R	a b r a c a d a b r	
A B R A C A D A B	a b r a c a d a b	
A B R A C A D A	a b r a c a d a	
A B R A C A D	a b r a c a d	
A B R A C A	a b r a c a	ABRACADABRA
A B R A C	a b r a c	BRACADABR
A B R A	a b r a	RACADAB
A B R	a b r	ACADA
A B	a b	CAD
A	a	A

FIG. 3.—ABRACADABRA.

letters from the complete word and let the letters fall away one at a time in each succeeding line. Take these away ever, but keep the rest until the writing is reduced to a narrow cone. Remember to tie these papers with flax and bind them round the neck." After wearing the charm for nine days it had to be thrown over the shoulder into a stream running eastwards. This incantation and charm was believed to be beneficial in treating fevers and various other diseases (fig. 3).

Incantation.—"A prayer and incantation for visiting of sick folkis." Used by Agnes Sampson, a famous witch of England, who was burned in 1590.

"All kindis of illis that euer may be,
In Chrystis name I conjure ye,
I conjure ye, baith mair and less,
By all the virtues of the mess,
And rycht sa, by the naillis sa,
That naillit Jesu, and na ma,
And rycht sa by the samyn blude,
That reiket ower the ruthful rood,
Furth of the flesh and of the bane,
I conjure ye in Goddis name."

Amulets and charms.—Amulets are material charms whose purpose is to protect the wearer against real or imagined dangers—witchcraft, evil eye, sickness, disease, accidents, etc. They are of various kinds and formed of different substances: Natural, as stones of a peculiar shape, roots, leaves, seeds, horns, teeth and claws of animals, various metals, etc., or artificial, as rings, strings, representations of the hand, eye, crescent, beads, etc., and written charms, quotations from sacred writings. The use of charms is practically world-wide, wherever the belief in witchcraft, evil eye, and demons is specially pronounced. But they are in special favor with the eastern nations and are very common in Mohammedan countries. The Mohammedans frequently use as amulets either a small copy of the whole Koran, the sacred book of the Mohammedan religion, or certain portions of it. The writing is covered with waxed cloth to preserve it from accidental pollution, and inclosed in a case of gold or silver, which is attached to a silk string, or a chain.

Peony root.—Carried in the pocket as a preventive of insanity. The root, or a necklace of beads, is suspended from the necks of children to prevent convulsions, and to cure epilepsy. Cat. No. 143,069, U.S.N.M.

Chestnut.—A horse-chestnut (begged or stolen) carried habitually in the pocket, as a preventive of rheumatism. A widely spread superstition among all classes of society. Cat. No. 143,070, U.S.N.M.

Scarlet silk.—A skein of scarlet silk thread, tied with nine knots, worn around the neck to prevent bleeding at the nose. Cat. No. 143,071, U.S.N.M.

Rabbit's foot.—The right forefoot worn in the pocket to prevent rheumatism. Cat. No. 143,068, U.S.N.M.

Mistletoe.—Small branches of the mistletoe, *Viscum album*, worn suspended from the neck as a specific against epilepsy, and an antidote for poisons. It should be cut with a gold knife, and when the moon is only six days old. Cat. No. 143,102, U.S.N.M.

Amulet.—A leather strap, with buckle, made from a part of a harness which has been worn by a horse. Firmly buckled around the wrist, and worn constantly, it greatly strengthens the muscles and ligaments, and cures sprains and other local affections. Cat. No. 143,111, U.S.N.M.

Amulet.—A spider put in a nutshell, and worn around the neck, was an ancient and famous remedy for ague, from the time of Dioscorides. Its fame has descended to recent times.

“ Only beware of the fever, my friends,
beware of the fever!

For it is not like that of our
Acadian climate,

Cured by wearing a spider hung around
one's neck in a nutshell!”
Longfellow's “Evangeline.”

Cat. No. 143,110, U.S.N.M.

Cramp bone.—The patella, or “kneecap,” of a sheep. To cure cramp. Worn next to the skin during the day, and laid beneath the pillow at night. Cat. No. 143,112, U.S.N.M.

Cramp ring.—A ring made from a nail that has been used to fasten a coffin, and that was dug out of a graveyard. A sovereign charm against cramps. Used in China, England, and occasionally in the United States. Cat. No. 143,114, U.S.N.M.

Voodoo, hoodoo, obi, or obeah.—A species of magic art or sorcery practiced by the African negroes, and continued to some extent by their descendants in the West Indies and the United States. The amulets or talismans used are usually bones, hair, teeth, feathers, rags, bits of wood, etc. This specimen consists of a chicken feather, some human hair, a drop of blood on a bit of rag, and a pine sliver. All are tied together and sewn in a piece of shirting. The amulet is worn on the neck as a preventive medicine, a cure-all, and to prevent the working of a "voodoo" on or against the wearer. Cat. No. 143,106, U.S.N.M.

Madstone.—Model, cut from the mineral halloysite, of a "madstone" in actual use. Believed to be the mineral of which some of the famous madstones are composed. It absorbs moisture with avidity, and adheres to a moistened surface until nearly saturated. Applied to the wound produced by the bite of a mad dog, it is said to adhere until the poison is entirely absorbed. The stone is then boiled in milk to remove the poison. Cat. No. 143,103, U.S.N.M.

Madstone.—A highly polished seed of *Gymnocladus dioica*, the Kentucky coffee tree, like the one in the Museum's collection, was offered to the Smithsonian Institution as a genuine madstone of proved efficacy for the sum of \$1,000. Cat. No. 143,104, U.S.N.M.

Madstone.—A biliary calculus, or gallstone, formed in the gall bladder of an ox. One of the earliest forms of madstones. Ibn Baithar (1248 A. D.) ascribes to it the power of attracting the poison of venomous animals. It was applied to snake bites as well as dog bites. Cat. No. 49,360, U.S.N.M.

Madstone.—Said to have been found in the stomach of a deer, by an Apache Indian of New Mexico. It is a pebble of carbonate of lime, which may have been swallowed by a deer with his food or water, and the surface etched by the action of the gastric juices. Sent to the Museum as a veritable madstone. Cat. No. 143,190, U.S.N.M.

Madstone.—A reputed madstone purchased from Mr. J. R. Scott, Cable, Wis. A brown, striated, porous pebble, deriving its attributed powers, no doubt, from its peculiar appearance and the not unusual fact that the person bitten by the dog recovered after the application of the stone. Cat. No. 143,492, U.S.N.M.

Madstone.—A ball of matted hair, such as is occasionally found in the stomach of domesticated cattle, buffaloes, and perhaps other ruminants. Two balls of this kind were sent to the Museum from Alva, Okla., in 1906, as veritable madstones. One of them was said to have been successfully used in two cases of dog bite. Cat. No. 143,201, U.S.N.M.

Coral.—Stops every flux of blood; drives away ghosts, illusions and dreams; hardens diseased gums; cleanses putrid sores; relieves pains in the stomach; and, taken in powder with wine, it cures gravel. Hung on fruit trees it insures fertility and protects from hail and blighting wind. In great repute during the Middle Ages both as a drug and as an amulet. Cat. No. 143,113, U.S.N.M.

Agate.—Emblematic of health; an enemy to all poisonous things; assuages thirst when held in the mouth. (Camillus Leonardus, fifteenth century.) Worn as an amulet for the cure of scrofula and skin diseases. (Albertus

Magnus, thirteenth century.) In Persian and Arabian medicine given internally, or worn in a finger ring for insanity, hemorrhages, gravel, etc.; bound upon the thighs of parturient women to facilitate labor. Used at the present day in Syria as a remedy for the "Aleppo boil." Cat. No. 143,118, U.S.N.M.

Onyx.—A powerful aphrodisiac and oxytocic. Used as an eyestone "it enters of its own accord, and if it finds anything within that is noxious it drives it out and tempers the hurtful and contrary humors." (Camillus

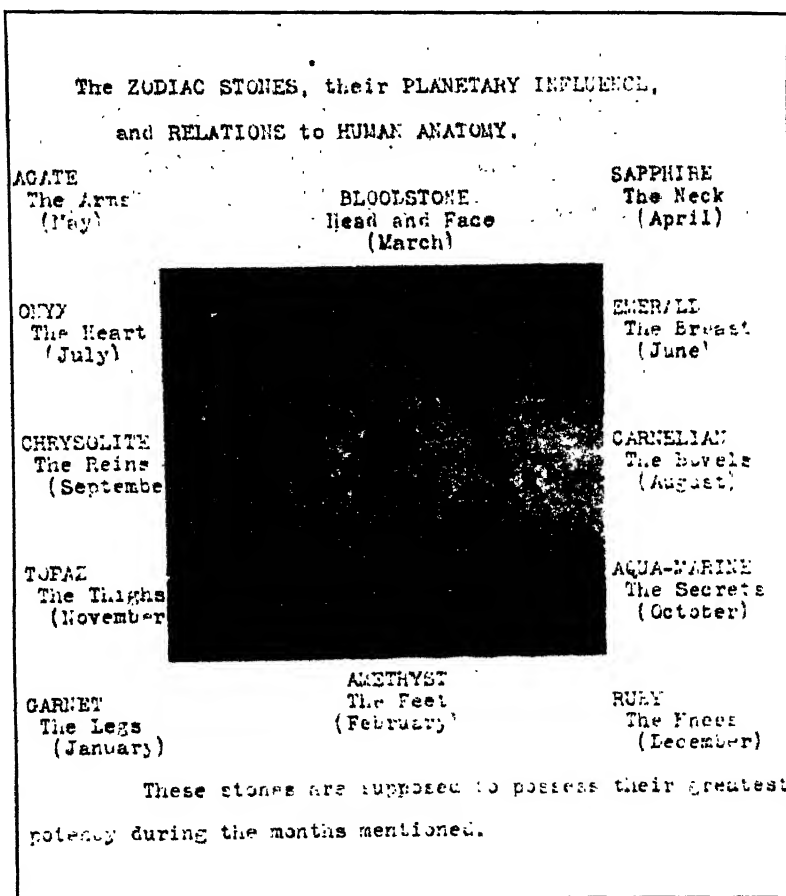


FIG. 4.—THE ZODIAC STONES.

Leonardus.) Said to cause nightmare, for the reason that "in the onyx is a demon, imprisoned in the stone, who wakes only of a night, causing terror and disturbance to sleepers who wear it." (Benoni.) Used at the present day by the Persians for the cure of epilepsy. Cat. No. 143,133, U.S.N.M.

Topaz.—Said to restrain anger, cure insanity, check hemorrhage, impart strength and good digestion. The powder taken in wine cures asthma and insomnia. "Rubbed on a bone the topaz gives a milky juice, and yet loses none of its weight." This juice taken internally for dropsy. (Epiphanius.)

Worn as an amulet it drives away sadness, strengthens the intellect, and bestows courage. (Porta.) Cat. No. 143,130, U.S.N.M.

Garnet.—Dispels poisonous and infectious airs. (Camillus Leonardus.) Like the ruby it foretells misfortune. Suspended from the neck it wards off the plague and thunder; taken internally it cures epilepsy, insanity, cholera, snake bite, and neutralizes drug poisons. Cat. No. 143,129, U.S.N.M.

Bloodstone.—Said to bring safety and long life to its possessor, and to be antidote to poisons. (Camillus Leonardus.) A remedy for dyspepsia. If "washed according to medicinal art" it was a styptic. In powder it was applied to ulcers, and, mixed with honey or white of egg, it was believed to be an excellent remedy for hard tumors. (Albertus Magnus.) Cat. No. 143,122, U.S.N.M.

Amethyst.—As an amulet it dispels sleep, sharpens the intellect, prevents intoxication, and promotes chastity. An antidote for all poisons. (Albertus Magnus.) According to Pliny, the amethyst is an antidote to drunkenness, "for being bound on the naval it restrains the vapor of wine, and dissolves ebriety." In Hindu medicine it is said to give strength, abate the heat of fevers, and cure fistula. Cat. No. 143,119, U.S.N.M.

Jasper.—Checks hemorrhages, strengthens the chest, lungs, and stomach, cures fevers and dropsy, and clears the sight. (Camillus Leonardus.) Galen (2nd Century) recommends that it be worn next the skin over the stomach, for the relief of dyspepsia. Burton (Anatomy of Melancholy) says: "If hung about the neck, or taken in drink, it much resisteth sorrow." Cat. No. 143,130, U.S.N.M.

Sapphire.—Among the Hindus the sapphire, unless perfectly flawless, was an unlucky stone. In the Middle Ages it was said to cure boils, carbuncles, and headaches, rested and refreshed the body, and gave color to the cheeks. (Camillus Leonardus.) Galen administered vinegar in which a sapphire had been soaked, in fevers. An ointment made with the powder cured inflammation of the eyes. Because of its extreme coldness it was thought to preserve the chastity of the wearer, and hence especially suited for ecclesiastical rings. The Buddhists esteem the sapphire, as a protective charm, above all gems. Cat. No. 143,138, U.S.N.M.

Carnelian.—Said to cure tumors and all wounds made by iron. (Epiphanius.) Preserved the strength, prevented hoarseness, and cleared the voice. In powder or worn as an amulet, it was supposed to be a sovereign remedy for hemorrhage. Rings cut from the stone are still worn to prevent bleeding from the nose. Cat. No. 143,123, U.S.N.M.

Ruby.—In Persian and Arabian medicine it was said to cure epilepsy, insanity, cholera, hemorrhage from the lungs, snake bite, and the effects of poisonous drugs; it purified the blood and freed the air from the infection of cholera. In the Middle Ages it was an amulet against poisons, plague, sadness, or evil thoughts; forewarned of danger by losing color. "It takes away vain thoughts, reconciles differences among friends, and makes a mighty increase of prosperity." (Camillus Leonardus.) Cat. No. 143,137, U.S.N.M.

Lapis lazuli.—Believed to cure melancholia. Used at the present day in India, Chile, and Peru as a laxative. In Hindu medicine it was regarded as a cooling medicine, and curative of biliousness. Cat. No. 143,131, U.S.N.M.

Chrysoberyl.—As an amulet it dispels evil dreams, fear, and melancholy. Possesses the general qualities of beryl. In Hindu medicine the chrysoberyl, set in gold and worn on the neck or hand, said to remove diseases and vicious habits, and to increase family, life, and happiness. Is also believed to lose its brilliancy in contact with poisons. Cat. No. 143,126, U.S.N.M.

Beryl.—Formerly much used in divination, as it was supposed to be the abode of spirits. As a remedy the powdered stone was taken internally for leprosy. Water in which the stone had lain was used as a lotion for the eyes, and was taken internally for flatulency and disorders of the liver. Cat. No. 143,121, U.S.N.M.

Amber.—Supposed to be "generated out of the urine of the lynx, and hardened by time." "It assuages pain in the stomach, and cures jaundice, flux, and kidney evil;" a remedy for all diseases of the throat. (Camillus Leonardus.) Often worn, in this and other countries, as an amulet for the relief of toothache and dropsy, and for the prevention of asthma, croup, and various infectious diseases. It is still used for the cure of goiter. Cat. No. 143,120, U.S.N.M.

Chalcedony.—Prevented and cured melancholy. Worn as an amulet it was preventive of danger during tempests and sinister events. (Camillus Leonardus.) Cat. No. 143,125, U.S.N.M.

Lodestone.—Magnetic iron ore. "Being carried about one it cures cramps and gout. In the hour of travail, if held in the hand, it facilitates the birth. If bruised and taken with honey, it cures dropsy; and the head being anointed with it cures baldness." "It also taketh away fears and jealousies, and reconciles wives to their husbands, and husbands to their wives." (Camillus Leonardus.) Cat. No. 143,132, U.S.N.M.

Opal.—In great repute as an eyestone and a remedy for all diseases of the eye. It preserves from contagious and infectious airs, drives away despondency, prevents fainting, heart disease, and malignant affections. (Giov. B. Porta, *Magiae naturalist*, sixteenth century.) Indicates the state of health of wearer, losing its brilliancy when the person is ill. Cat. No. 143,134, U.S.N.M.

Pearls.—In Egyptian medicine an electuary of pearl powder was said to strengthen the body and give luster to the eyes. Largely used in China as an aphrodisiac and medicine for hemorrhage, stomach troubles, etc. In Persian and Arabian medicine pearls were said to cure all mental diseases. In Europe, so late as the seventeenth century, they were used as a remedy for insanity. A decoction of pearl powder in distilled water was one of the remedies given to the insane Charles, King of Spain. Cat. No. 143,135, U.S.N.M.

Quartz.—According to Hindu authorities, the crystal, worn as an amulet, removed baneful astral influences, cured biliousness, fever, and fistula, and was a specific for leprosy and consumption. In the Middle Ages it was given, in powder, for dysentery. A crystal held against the tongue assuaged the thirst of fevers, neutralized snake poison, and protected the wearer from drowning, fire, and thieves. Cat. No. 143,136, U.S.N.M.

Turquoise.—Worn as an amulet to protect from accident and to insure health and success; it was also said to protect from drowning, lightning, and snake bite. In Arabian and Persian medicine it was said to cure diseases of the head and heart, hernia, tumors, strictures, epilepsy, insanity, and cancer. In Egypt cataract is said to be cured by the local application of a turquoise which had been dipped in water, the application being accompanied by the chanting of the name Allah. Cat. No. 143,140, U.S.N.M.

Zircon.—A charm against plague, evil spirits, and lightning. Cat. No. 143,141, U.S.N.M.

Cat's-eye.—Applied to the throat for the relief of croup. Tied in the hair of parturient women to facilitate labor. In Hindu medicine the cat's-eye was said to be "warm and sour" and curative of cold, chronic derangement of the spleen, and colic. The Persians used the powdered stone as a remedy for dropsy. Cat. No. 143,124, U.S.N.M.

Disk cut from a human skull.—Found in Jung's Hill, near Florence, Nebr., 6 feet 2 inches from the surface, among other human bones, flint chips, and various Indian remains. Probably used as an amulet or fetich. Cat. No. 143,462, U.S.N.M.

Deer's foot.—For the cure of toothache, swellings, and itching eruptions. It is to be warmed and rubbed over the painful or swollen parts. Cat. No. 143,097, U.S.N.M.

Snake slough.—The epidermis of a snake. In England it is bound around the forehead and temples to cure headache. It is also used for extracting thorns. If the thorn is in the palm, the slough is applied to the back of the hand. Cat. No. 143,115, U.S.N.M.

Belemnite.—Regarded as a thunderbolt. Cat. No. 143,480, U.S.N.M.

Lucky "holed stone."—Cat. No. 143,481, U.S.N.M.

Stone for curing cows of sickness.—Cat. No. 143,482, U.S.N.M.

Penny.—A penny, bored, and worn as a charm. Cat. No. 143,483, U.S.N.M.

Miscellaneous medicinal and religious amulets, made in England, and used in trading with the natives of certain countries.

Rosary.—A trade rosary of carnelian. Cat. No. 143,463, U.S.N.M.

Amulet for the Gold Coast of Africa.—Cat. No. 143,464, U.S.N.M.

Shell amulet for Madagascar.—Cat. No. 143,465, U.S.N.M.

Shell amulet for the Congo.—Cat. No. 143,466, U.S.N.M.

Tiger's tooth amulet for the Congo.—Cat. No. 143,467, U.S.N.M.

Leopard's tooth amulet for the Congo.—Cat. No. 143,468, U.S.N.M.

Glass cowries for the Congo.—Cat. No. 143,469, U.S.N.M.

Crescent beads for Zanzibar.—Cat. No. 143,470, U.S.N.M.

Glass amulet for India.—Cat. No. 143,471, U.S.N.M.

Glass amulet for the Soudan.—Cat. No. 143,472, U.S.N.M.

Carnelian beads for the Gold Coast.—Cat. No. 143,473, U.S.N.M.

Tubular beads for the Congo.—Cat. No. 143,474, U.S.N.M.

Pendant amulets for the Gold Coast.—Cat. No. 143,475, U.S.N.M.

Amber beads (curative) for Zanzibar.—Cat. No. 143,476, U.S.N.M.

Coral beads for the Congo.—Cat. No. 143,478, U.S.N.M.

Charm necklet for the Gold Coast.—Cat. No. 143,479, U.S.N.M.

Talismans.—Images or other material objects, generally bearing cabalistic characters, words, or signs, supposed to work wonders whether kept in one's possession or not.

Talismans.—Small silver images of the whole or parts of the body, representing by form or attitude painful or diseased organs. These images are often hung in the churches in some countries, either as votive offerings after restoration to health, or as a material part of an invocation or appeal for Divine aid. (See fig. 5.) Cat. No. 73,945, U.S.N.M.

Talisman.—A small packet containing a chapter of the Koran, carefully folded, covered with leather, and protected from moisture by some resinous application. Used by the Soudanese warriors for protection against wounds and disease. Cat. No. 143,109, U.S.N.M.

Fetiches.—Material objects believed to be the dwelling of a spirit, or to represent a spirit, that may be induced or compelled to help the possessor.

Zuni fetich.—A clay image of the mountain lion. The spirit of the mountain lion guards the North, and is master of the gods of the hunt. The hunter

makes invocation to the indwelling spirit of this image for assistance in the pursuit and capture of game and for protection against injury. Cat. No. 128,669, U.S.N.M.

Indian fetich.—Carved out of a block of wood in imitation of a naked Indian in the attitude of, and probably impersonating, a quadruped. One of the articles composing the outfit of an Alaskan Indian medicine man. (See fig. 6.) Cat. No. 143,105, U.S.N.M.

Fetich.—A conical ball of clay about 3 inches long by 2 inches in greatest diameter. Used in the magic medicine of the Kroos of western Africa. Cat. No. 4,805, U.S.N.M.

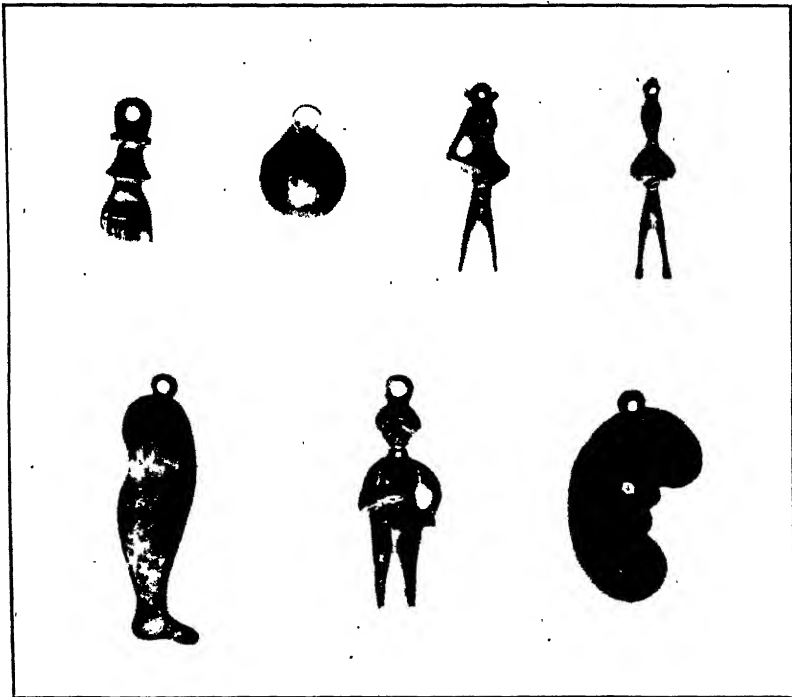


FIG. 5.—SMALL SILVER IMAGES.

Cherokee fetich.—A flint arrowhead is put into a decoction prepared for a vermifuge, in order that the indwelling spirit may communicate to the medicine the cutting quality of the stone, whereby the worms may be cut in pieces. Cat. No. 143,088, U.S.N.M.

Transference of disease.—One of the magic medical practices of all countries. "When disease was recognized, though tardily, to have positive existence, and the fact realized that, despite prayers and offerings, it might be mysteriously communicated by the sick to another person, * * * without conscious act on his part, * * * why might he not of purpose transfer his complaint to something of a lower order, which should suffer the disease in his place?" W. G. Black, in Folk-medicine.

Section of a tree grown on the Government grounds near the naval hospital, Norfolk, Va.—The tree had been tapped, human (negro) hair inserted in the hole, the hole plugged and sealed with clay. Four inches of new growth formed over the plug. Reckoning by count of the annual rings, the plug was inserted more than 50 years before it was found. The operation upon the tree was doubtless performed either (1) to relieve headache by transferring it to the tree by means of the hair; or (2) to cause pain in the head of the original possessor of the hair, the lock having been obtained by an enemy, placed in the hole made in the tree, and the plug driven down hard upon it.



FIG. 6.—INDIAN FETICH.

If you can get a few strands of your enemy's hair, bore a hole in a tree, put them in, and plug up the hole; you can thus give him a headache which can not be relieved until the hair is taken out of the tree. *Encyclopedia of Superstitions.* (See pl. 2.) Cat. No. 143,207, U.S.N.M.

Disease transference.—For warts: Rub the warts with a cinder; the cinder then to be tied up in a paper and dropped where four roads meet. The warts will be transferred to whoever opens the parcel. Berdoe, "The Origin and Growth of the Healing Art." Cat. No. 142,209, U.S.N.M.

Signatures.—Some outward sign appearing upon plants, minerals, and other objects, believed to point to their medicinal uses. This belief is very evident in oriental medical practice, and was prevalent in European countries up to the eighteenth century.

Vegetable lamb; golden-haired dog; Tartarian lamb.—The rhizome and base of the stipes of a fern (*Cibotium barometz*). The rhizome is densely covered with soft golden-brown hairs, and with the bases of the stipes for legs bears a rude resemblance to a small quadruped. It was one of the marvelous drugs of European pharmacy in the sixteenth and seventeenth centuries, and was believed to be a sort of plant animal. It was said to spring from a seed, and root in the earth like a plant, and to feed upon surrounding herbs like an animal, turning upon its root until it had devoured all within reach, when it perished from starvation. The rhizome is thought by the Chinese to be tonic and aphrodisiac. The fine hairs are an efficient styptic. (Fig. 7.) Cat. No. 142,607, U.S.N.M.

Stalactites.—"Moreover this stone, reduced to a fine powder and one ounce of it given inwardly, is wont efficaciously to provoke sweat; and in bones

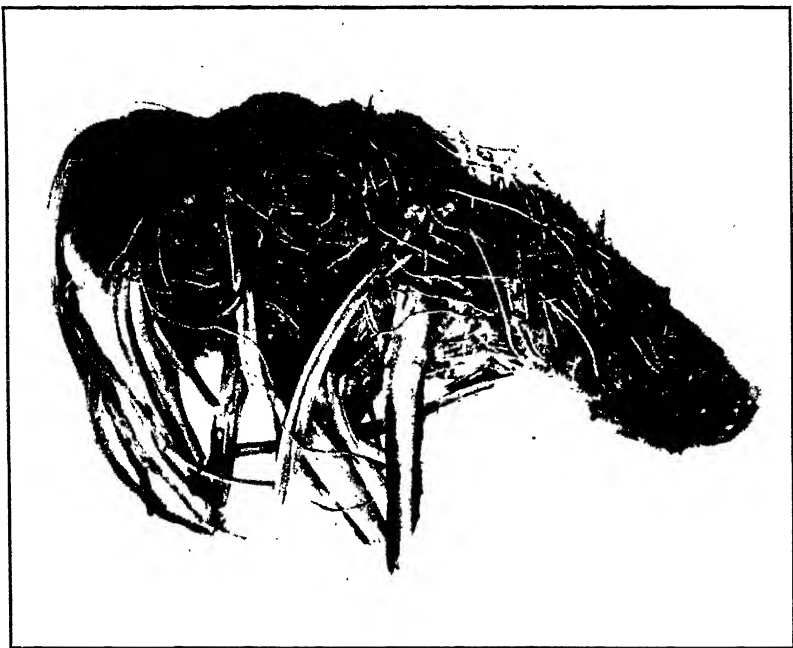


FIG. 7.—VEGETABLE LAMB.

broke, being externally applied, mixed with convenient playsters, it is exceedingly helpful. If by the benefit of distilled vinegar, it be resolved into a salt, in the stone and knotted podagrical effects, by reason of its signature it efficaciously operates." (Crollius, Treatise of Signatures, 1669.) Cat. No. 49,357, U.S.N.M.

Walnuts.—"Walnuts have an entire signature of the head; the exterior rinde, or herby encompassment, of the pericranium: Wherefore salt of the rindes, for wounds of the pericranium, is a singular remedy. The interior hard rinde, or woody shell, of the cranium. The thin skin encompassing the kernel, of the skin and membranes of the brain. The kernel hath the figure of the brain itself: Therefore it is also helpful to the brain. For if the kernel beaten be moistened with the quintessence of wine, and applied to the crown of the head, it comforts the brain and head wonderfully." (Crollius, Treatise of Signatures.) Cat. No. 143,089, U.S.N.M.

Evil eye.—The belief in the power of some persons to bring misfortune, sickness, and even death to men or animals by gazing at them, is one of the most ancient, widespread, and persistent of human superstitions. This belief was, and is universal among savage races everywhere; it was sanctioned by the classical authors, the fathers of the church, the medieval physicians, and is still a matter of implicit faith with the people of many countries. In former days, in England, people supposed to have the evil eye, were put to death, and so late as the seventeenth century two women, who were believed to have fascinated and thereby caused the death of the Earl and Countess of Rutland and their children, were executed. Every form of magic has been resorted to for defense against the evil eye, and objects innumerable, both natural and artificial, have been credited with this power.

Horns.—Horns, in one form or another, are, of all objects, the most common defense against the evil eye. The people of Senegal, Palestine, Greece, Holland, the Druses of Lebanon, the Jewesses of Tunis, the women of South America, the North American Indians, the Belgians and Saxons of old, all wore horns on their heads in some manner, on headdresses or helmets, to ward off that awful, universal, unescapable, mystic glance that has continually harassed man in all quarters of the globe. (See pl. 2.) Cat. No. 143,503, U.S.N.M.

Amulet.—A silver image of a merman, or Triton, with the body of a man and the tail of a fish. One of many variations of amulet almost universally worn by Italian children for protection from the evil eye and from sickness and accidents in general. In this form perhaps specifically to protect from drownings. Cat. No. 143,501, U.S.N.M.

Charms.—The charms illustrated in figure 8 are made in England for the Italian market where they are in general demand by the people, especially for the protection of children, who are supposed to be peculiarly susceptible to the evil eye. Cat. Nos. 143,484-143,487, U.S.N.M.

Sympathetical cures.—A curious chapter in the history of medicine is found in the popular belief in "sympathetical cures," which prevailed in England during the reigns of James I and Charles I.

Sympathetic powder—Calcined copper sulphate.—Powder formerly supposed to have the property of curing a wound, if applied to the weapon inflicting it, or a piece of the bloodstained garment. This method of healing was in high repute during the seventeenth century, and learned essays were written to prove that the unquestioned effects produced by the powder were neither diabolical nor magical but were caused by a peculiar emanation, which they called "magnetick."

"The method, and primitive manner how to make use of this sympathetical remedy, was to take onely some vitriol, and dissolve it in raine water, in such proportion, that putting therein a knife, or some polished iron, it should come out changed to the color of copper; and into this water they did put a rag of cloth embrued with the blood of the party hurt. And every time that one put new water of vitriol with fresh powder and new cloth, or other bloudied stuff, the patient should feel new easement as if the wound had been dressed with some sovereign medicament."

Sir Kenelmee Digby, "Touching the cure of wounds by powder of sympathy;" and J. B. Van Helmont, "A ternary of paradoxes." Cat. No. 143,504, U.S.N.M.

PSYCHIC MEDICINE

Psychic, or mind, medicine is a general term applied to methods of treating disease through mental impressions. States of mind are induced, or mental qualities stimulated to such a degree as to modify physiological function, and through such modified function even to produce tissue change. Confidence, hope, faith, are aroused, the

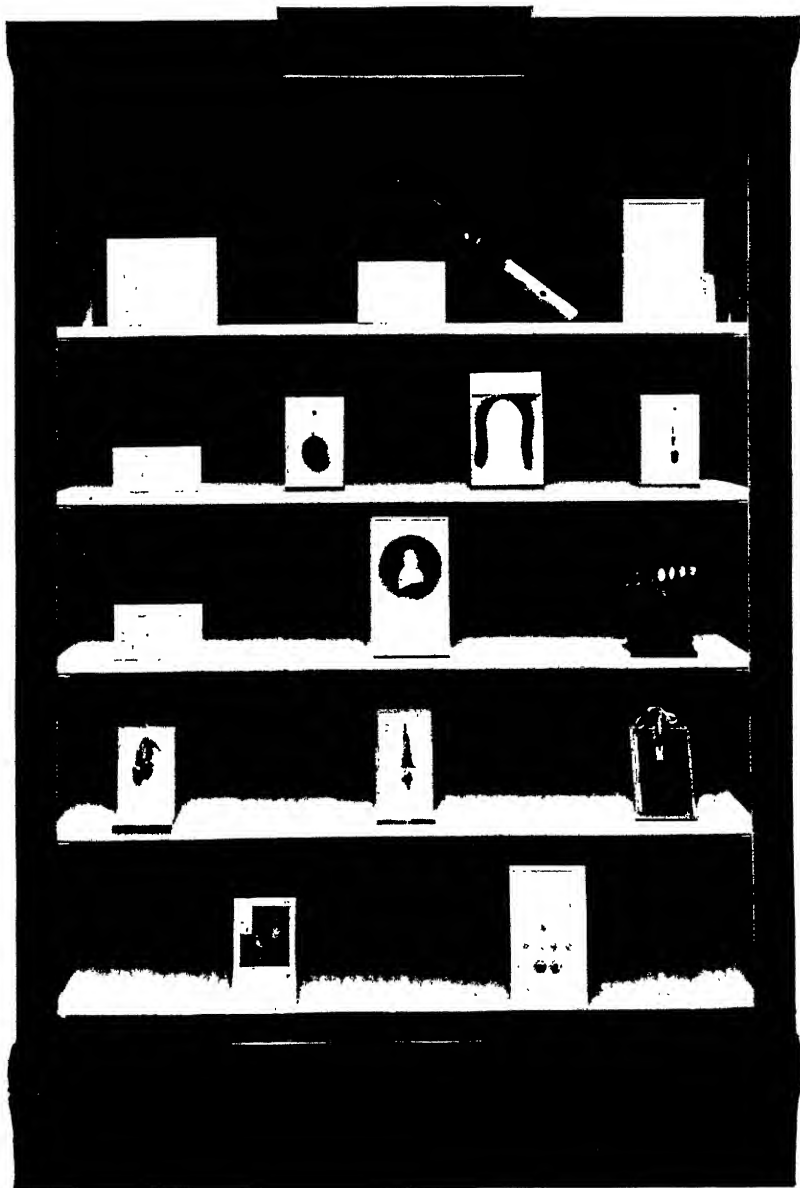


FIG. 8.—CHARMS WORN FOR PROTECTION AGAINST THE EVIL EYE.

imagination excited, the attention fixed by suggestion or individual effort, or certain peculiar mental conditions induced which are known by the names of mind healing, faith cure, mesmerism, hypnotism, etc.

All these psychic conditions may be established by sensory impressions, as by music (incantations), visual objects to fix the attention, eyestrain to modify consciousness, by manipulation, by personal influence (magnetism) of the mind doctor, or by mental effort on the part of the patient.

Since these methods rarely call for paraphernalia, implements, or apparatus of any kind, but are merely ceremonial, it is not possible to illustrate this form of medicine, except by a few objects.



MEDICAL EXHIBITS—PSYCHIC MEDICINE

FOR DESCRIPTION OF PLATE SEE PAGE 18

Music.—The use of instrumental music in the treatment of disease is of very ancient origin. David is said to have cured Saul of an attack of melancholia (mania) by playing on the harp in his presence. The eminent Greek physicians Pythagorus, Hippocrates, Theophrastus, Galen, and others of renown recommended it.

Jean Battiste Porta, in the sixteenth century, advised that musical instruments be made of wood of medicinal plants, and affirmed that the music of these instruments would produce the medicinal effects of the plants.



FIG. 9.—EGYPTIAN HARP.

In later times it is said to have been successfully used in the treatment of the delirium of fevers, the plague, gout, poisoned wounds, to mitigate the pain of surgical operations, and especially in nervous affections such as hysteria and melancholia. It is found to be beneficial in the management of the insane, and musical entertainments are frequent in all modern institutions for their treatment.

Egyptian Harp.—From a wall painting in a tomb at Thebes. The harp illustrated in Figure 9 probably represents a larger and more elaborate form of the musical instrument used by David for the relief of Saul during an attack of melancholia.

“But the spirit of the Lord departed from Saul, and an evil spirit from the Lord troubled him. And it came to pass, when the evil spirit from God

was upon Saul, that David took an harp and played with his hand; so Saul was refreshed and was well, and the evil spirit departed from him." (Samuel, xvi, 14-23.) Cat. No. 143,505, U.S.N.M.

Metallotherapy.—A method of curing disease by the application of metallic substances to the surface of the body. It has been advocated from the time of the middle ages to the present, principally as a prophylactic and a remedy for distinctly nervous diseases. In most instances this method of therapy falls under the head of mind medicine, appealing to the credulity and imagination of the patient.

Copper.—A plate of copper to be worn as a preventive of cholera, and a remedy for facial neuralgia and other nervous affections. Commonly used in Europe in the early part of the nineteenth century. (See pl. 3.) Cat. No. 143,149, U.S.N.M.

Mercury.—A small tube filled with mercury, worn suspended from the neck as a protection from the cholera. Said to have been used by many people in Germany during the first half of the nineteenth century. The custom had its origin in the immunity of workmen in quicksilver mines during an epidemic of cholera. Cat. No. 143,147, U.S.N.M.

Horseshoe.—There are many superstitions connected with the horseshoe, but in metallotherapeutics the healing effects of an old horseshoe were attributed to the magnetic quality acquired by long beating upon stony roads or pavements. It was believed to be a sovereign remedy for cramps, and was to be kept at the bedside where it could readily be seized in case of an attack. Cat. No. 143,148, U.S.N.M.

Laying on of hands.—Figure 10 is a copy of an illustration from "The Miraculous Conformist, or an Account of Marvailous Cures Performed by the Stroking of the Hands of Mr. Valentine Greatarick."

Valentine Greatarick, born in Ireland, attained great reputation, about the middle of the seventeenth century, by his marvelous cures of diseases by stroking with the hands. At first he confined his efforts to the cure of scrofula, or "King's evil;" subsequently he successfully treated patients with many other diseases, such as apoplexy, convulsions, palsy, etc.

"I saw him Stroke a man for a great and settled paine in his left Shoulder, which rendered his Arme uselesse: upon his stroking it the pain removed instantly into the end of the Musculus Deltodes: being stroked there, it returned to the Shoulder again: thence (upon a second stroking) it flew to the elbow, thence to the wrist, thence to the shoulder again; and thence to the fingers: whence it went out upon his last stroking, so as that he moved his arme vigorously every way."

By Henry Stubbe, physician, Oxford, 1666. Cat. No. 143,506, U.S.N.M.

Royal touch.—A mode of healing said to have originated with Edward the Confessor. (1004-1066.) It was practiced by suc-

ceeding kings and queens of England, with occasional exceptions, down to Queen Anne. (1664–1714.) A register of persons touched by King Charles II, from May, 1662, to April, 1682, gives the number at 92,107. Healing by touch was also practiced by the French kings, and it is claimed by some French historians that the custom originated in France. Until the time of Henry VII no peculiar ceremonies attended the practice of healing by touch. This monarch established a special religious service to be employed at the healings, during which a piece of gold (touchpiece) was presented to the patient, to be worn as an amulet suspended from the neck.



FIG. 10.—LAYING ON OF HANDS.

The ceremony of touching for scrofula, or King's evil, as practiced by Charles II, is described by Evelyn in his memoirs as follows:

"July 6, 1660. His majestie sitting under his state in ye banquetting house, the chirurgeons cause the sick to be brought, or led up to the throne, where they kneeling, ye king strokes their faces or cheeks with both his hands at once, at which time a chaplaine in his formalities says: 'He put his hands upon them and he healed them.' This is said to everyone in particular. When they have all been touched they come up againe in the same order, and the other chaplaine kneeling, and having angel gold strung on white ribbon

on his arme, delivers them one by one to his majestie, who puts them about the necks of the touched as they passe, while the first chaplaine repeats, 'That is ye true light who came into ye world.' Then follows an epistle (as at first a gospell) with the liturgy, prayers for the sick; lastly ye blessing; and then the lord, chamberlaine and comptroller of the household, brings a basin, ewer and towel, for his majesty to wash."

Touchpiece.—A gold coin of the time of Charles II of England, such as was used by that king in the ceremony of "touching" for the cure of scrofula, or

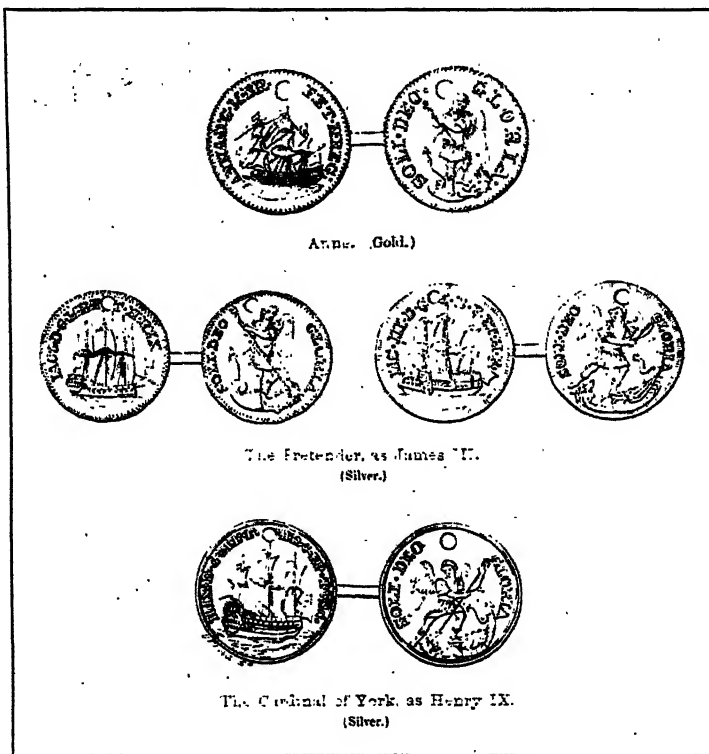


FIG. 11.—TOUCHPIECES FOR DISTRIBUTION AT THE HEALINGS.

King's evil. About four-fifths of an inch in diameter, bearing on one side figures of Saint George and the Dragon and the legend "Soli deo Gloria;" on the other a figure of a ship under sail, with the legend "Car. II, DG. M. B. FR. ET. HI. REX." Cat. No. 143,199, U.S.N.M.

Hypnotism.—Animal magnetism, mesmerism, somnambulism, trance, ecstasy. An artificially produced or self-induced mental state, in which the mind becomes more or less passive, and both consciousness and will may be controlled or abolished by the influence of command or suggestion. The mental impressions made by the senses may be perverted or enfeebled or interrupted, muscular ir-

ritability greatly increased, and various and often remarkable nervous phenomena exhibited. As one of the magic arts it was practiced by the ancient Egyptians, Hindus, and Greeks; as a demoniacal possession, or a miraculous interposition of Divine Providence, it is familiar in the religious history of every nation and period of time.

Friedrich Anton Mesmer. Born in Weil, Germany, in the year 1733; died in the year 1815. He gave the name to that form of psychic medicine known as mesmerism or hypnotism. At first he effected cures by stroking the diseased parts of the body with magnets. Afterward, with the aid of the mysterious surroundings of the pro-

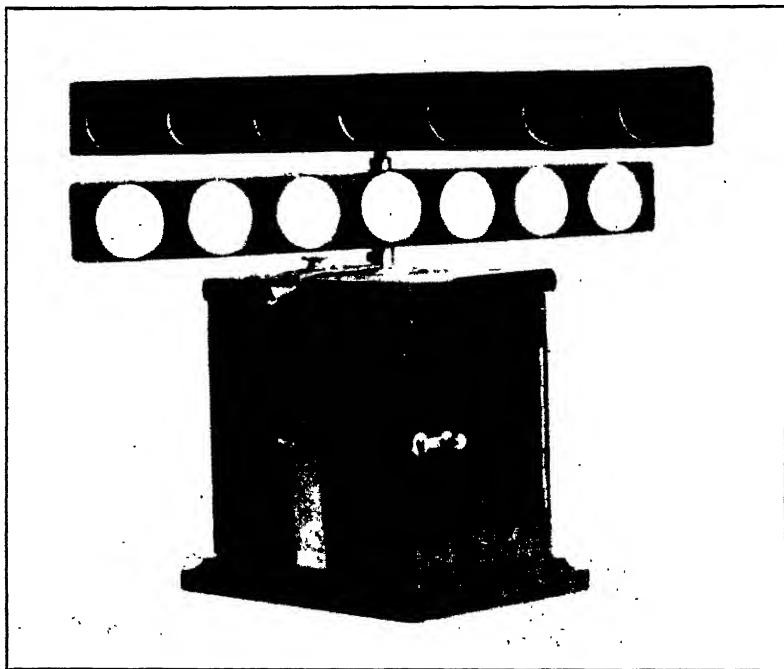


FIG. 12.—MIRROR HYPNOTIZER.

fessed magician, he produced upon his patients the well-known nervous phenomena of hypnotism by a touch, by "passes" with his hands, or even by a look. Though many of his methods were those of the charlatan, yet the effects produced were real, and were attributed by him to what he called animal magnetism, and not to any form of magic. (See pl. 3.) Cat. No. 143,151, U.S.N.M.

Mirror hypnotizer.—Consists of two wooden arms about 9 inches long, in each of which are set circular mirrors, seven on each side. The two arms are made to revolve in opposite directions by means of clockwork. Some subjects are peculiarly susceptible to the dazzling effect of the revolving mirrors, especially those who have been hypnotized before. (See "Man and Abnormal Man," Arthur MacDonald, p. 189.) (Fig. 12.) Cat. No. 143,204, U.S.N.M.

Ball hypnotizer.—A polished nickel-plated ball mounted on a lead wire. The wire is intended for attachment to a headband, and being of lead it may readily be bent to a position a little above the level of the eyes of the subject and slightly within the natural focal distance, so as to produce a certain amount of eyestrain and consequent fatigue of the ocular muscles. The effect of this and other instruments of the kind are usually intensified by "suggestion" on the part of the operator. Cat. No. 143,205, U.S.N.M.

Glass refractor.—One of the means used to induce the condition of hypnotism. The subject is directed to gaze fixedly at a faceted piece of glass, or other bright object, held about 8 inches from the eyes, and above the line of horizontal vision. The fixed attention, together with the eyestrain, are sufficient to excite in some persons the peculiar psychic phenomena known as hypnotism or mesmerism. Cat. No. 143,090, U.S.N.M.

EGYPTIAN MEDICINE.

Egyptian medicine is the earliest of which there is a written record, dating as far back as 1550 B. C. In its prehistoric stage, it was doubtless founded on superstition and practiced by magic arts. In its earliest historic period, the sick were taken to the market place "that all who pass by, and have had or seen the like distemper, may give them advice." Later, medicine developed into an orderly system, and at an early historic period, the knowledge of disease and remedies had become quite extensive.

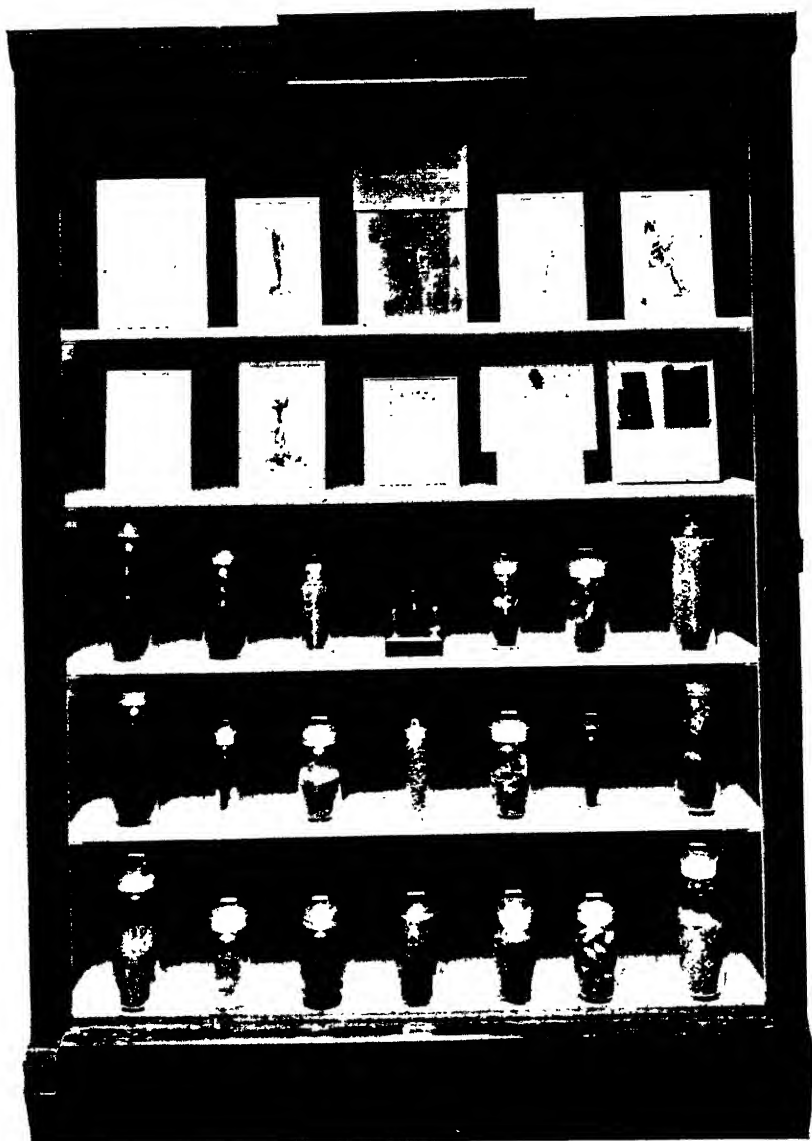
The chief sources of knowledge of Egyptian medicine are the writings of Herodotus (about 480 B. C.), Diodorus Siculus (about 40 B. C.), Galen (130–200 A. D.), and Clement of Alexandria (about 220 A. D.), supplemented by several very ancient papyri, relating to medicine, found in Egyptian tombs.

Like other arts and sciences, medicine was supposed to have originated with the mythological deities of the country, notably Thoth, Osiris, Isis, Horus, and Imhotep. It was practiced in large part by the priesthood of these divinities, and consequently the preparation and administration of remedies were generally accompanied by incantations and invocations, though the practice of the strictly magic arts was severely interdicted. The "Hermetic" medical books, having been given out by the God Thoth, came to be regarded as sacred and any deviation from their rules as sacrilege.

In process of time, the doctors became divided minutely into specialists, until, as Herodotus states:

"The art of medicine is so practiced in Egypt that there is found an individual healer for each individual disease; hence, the whole country is filled with healers."

Many drugs—animal, vegetable, and mineral—were used, of which several hundred are mentioned in existing papyri. Only a few of these can be positively identified. Some of them are of known therapeutic value; others inert; and some are strange and repulsive.



EXHIBITS OF ANCIENT EGYPTIAN MEDICINE

FOR DESCRIPTION OF PLATE SEE PAGE 22

The ancient Egyptians were skilled in pharmacy, which art was said to have been communicated by Horus, to whom it was taught by his mother, Isis. The papyri contains numerous formulæ, many of them complex, in style quite like prescriptions of the present day.

The records give evidence of considerable expertness in operative surgery, such operations as venesection, circumcision, castration, and even lithotomy and amputation being mentioned. As oculists, the Egyptians were noted, and Herodotus states that "Cyrus sent to Amasis (500 B. C.) and had for him an oculist—the best in the whole land of Egypt."

Old Egyptian medicine began to decline, with the first influx of foreigners, during the seventh century B. C., and the beginning of the end came when Amasis (570–526 B. C.) received the Greeks

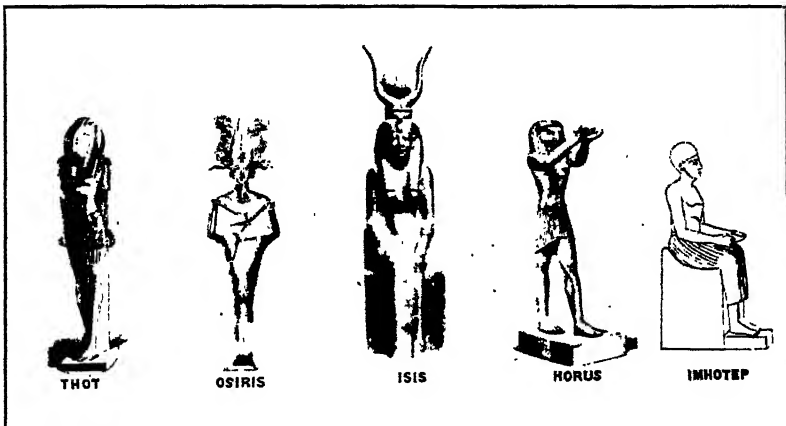


FIG. 13.—THOT, OSIRIS, ISIS, HORUS, IMHOTEP.

into the country. It entirely vanished before the Greek system, or survived only as a wretched abortion of magic and sorcery.

Thot (*Thoth*, *Tot*, *Althothis*).—The God of Wisdom. Identified by the Greeks and Romans with Hermes and Mercury. All of the arts and sciences emanated from him, including medicine, astronomy, and magic. Through his body flowed the mysterious fluid "Sa," carrying life and health, which he could communicate to human beings. On his wings of an ibis, he was able to bear the souls of the dead over the lake of Rha to the shores of Paradise. He was author of 36 "Hermetic books," of which six pertained to medicine, as follows: 1. Anatomy; 2. General diseases; 3. Surgical instruments; 4. Medicine; 5. Diseases of the eye; 6. Diseases of women. (Fig. 13.) Cat. No. 143,330, U.S.N.M.

Osiris (*Aps*, or *Serapis*).—An Egyptian god. Osiris and Isis, his wife and sister, are said to have invented the arts which are necessary to life, including agriculture and medicine. (Fig. 13.) Cat. No. 143,333, U.S.N.M.

Isis.—An Egyptian goddess, wife and sister of Osiris and mother of Horus. The chief divinity of the healing art, the goddess of procreation and birth. She invented many medicaments and "was very expert in physick." Being

raised to the dignity of goddess, she still takes care of the health of men, and "those who implore her succor find themselves immediately relieved." She was called the Lady of Enchantments, having originated many of the charms and invocations used in the Egyptian practice of medicine. (See fig. 13.) Cat. No. 143,331, U.S.N.M.

Horus.—Son of Osiris and Isis. One of the founders of the art of medicine. Having been put to death by Set, he was restored to life by his mother, Isis, who later revealed to him the secrets of pharmacy. He was called the God of Divination, which he also learned of his mother. He is represented with the head of a hawk. (See fig. 13.) Cat. No. 143,334, U.S.N.M.

Imhotep; I-em-hotep.—A learned physician, probably a priest of Ra, the sun god. He lived during the third dynasty, about 3,500 years B. C. In the course of ages he was deified as the special God of Medicine. His name I-em-hotep, is translated "He who cometh in peace," and he is described as the good physician of gods and men, kind and merciful, assuaging the sufferings of those in pain, healing the diseases of men, and giving peaceful sleep to the restless. His great temple stood outside the eastern wall of Memphis, near the Serapeum. (See fig. 13.) Cat. No. 143,332, U.S.N.M.

Papyrus Ebers.—The Papyrus Ebers is a treatise on materia medica, pharmacy, and therapeutics, one of the oldest known medical works; written 1,552 years before the Christian era, in the time of Moses, and before the exodus of the Israelites from Egypt. It was found near the necropolis of Thebes, in Upper Egypt, in 1872.

Written in Hieratic characters upon a kind of paper prepared from the papyrus plant, in a sheet 12 inches wide and 100 feet long closely rolled into a scroll.

It contains references to many drugs, animal, vegetable, and mineral, and gives numerous formulæ for the compounding of medicine and the therapeutical indications for their use.

Among the animals mentioned are: The buffalo, stag, ox, pig, camel, ram, dog, crocodile, bat, goose, tortoise, beetles, and flies.

Among the plants: Acacia, sweet flag, wormwood, myrrh, frankincense, coriander, saffron, cumin, citron, henbane, juniper, lettuce, flax, mandrake, olive, pomegranate, castor-oil plant, willow, sesamum, and fenugreek.

Among the minerals: Sea salt, niter, charcoal, lead, bronze, antimony, copper, lapis lazuli, and sapphire.

Miscellaneous remedies: Blood, human brains, urine, feces, genitals of cats, various oils, stale beer, honey, wine, milk, yeast, eggs, and wax.

Therapeutics: Mention is made of purgatives, anthelmintics, tonics, antilithics, abortives; remedies for diseases of the stomach and heart, for fistula, hemorrhoids, strangury, hemicrania, diarrhea, conjunctivitis, cataract, inflamed eyes, granular lids, baldness, cancer, gangrene, boils, toothache, erysipelas, eruptive diseases, various diseases of women; as well as instructions for bandaging wounds, the operation for stone, foetal extraction, removal of tumors, etc. In all showing careful observation of diseases and intelligent application of remedies.

The work also contains proof that the ancient Egyptians were tolerably well versed in superficial anatomy for nearly all parts of the human frame are mentioned as well as the larger viscera. (See fig. 14.) Cat. No. 143,511, U.S.N.M.

Prescription from the Papyrus Ebers.—Written about 1552 B. C., in the hieratic (script) writing of that period, with translations into hieroglyphic Egyptian, phonetic English, and literal English. (See fig. 15.) Cat. No. 143,335, U.S.N.M.

Egyptian medicine chest and stone case.—Picture of a medicine chest of the wife of Pharaoh Mento-hotep, of the XI dynasty, 2500 B. C., and the stone case in which it was found in the queen's tomb. The chest contained six vases, one of alabaster and five of serpentine, with dried remnants of drugs, two spoons, a piece of linen cloth, and some roots, inclosed in a basket of straw work. (See fig. 16.) Cat. No. 143,512, U.S.N.M.

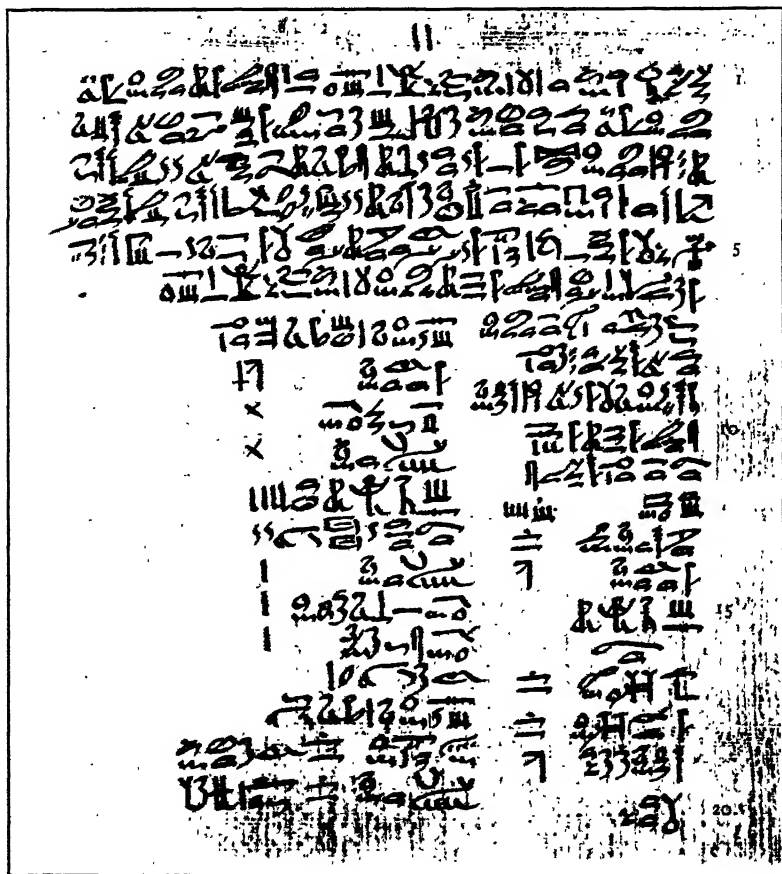


FIG. 14.—A PHOTOGRAPHIC COPY OF A SECTION OF THE PAPYRUS EBERS, REDUCED IN SIZE, TAKEN FROM A FACSIMILE, IN COLORS, OF THE ORIGINAL.

Some medicinal materials of the ancient Egyptians.—The Papyrus Ebers was supposed by its discoverer to have been compiled about the time when Moses was living in Egypt, a century before the Exodus. While the Jews were captives in Egypt it is reasonable to suspect similarity in their materia medica and that of the Egyptians of about the same period. This similarity is evident, passages from the Old Testament of the Bible referring to many of the medicinal substances mentioned in the Papyrus Ebers.

A few of these ancient drugs which are well known, and used up to the present time, are included in the historical collection.

Mastich.—A resinous exudation from *Pistacia lentiscus*, a shrub or small tree growing on the shores and islands of the Mediterranean. It was one of the ingredients of "kyphi" much used by the Egyptians for fumigations. Cat. No. 49,963, U.S.N.M.

Saffron.—The stigmas of *Crocus sativus*. Saffron is a very ancient drug mentioned by Solomon, Homer, Hippocrates, and Virgil. It was an article of traffic on the Red Sea in the first century. It entered into the composition of all sorts of medicine, external and internal, and was used as a condiment and perfume. Severest penalties, even death, were inflicted on those guilty of its

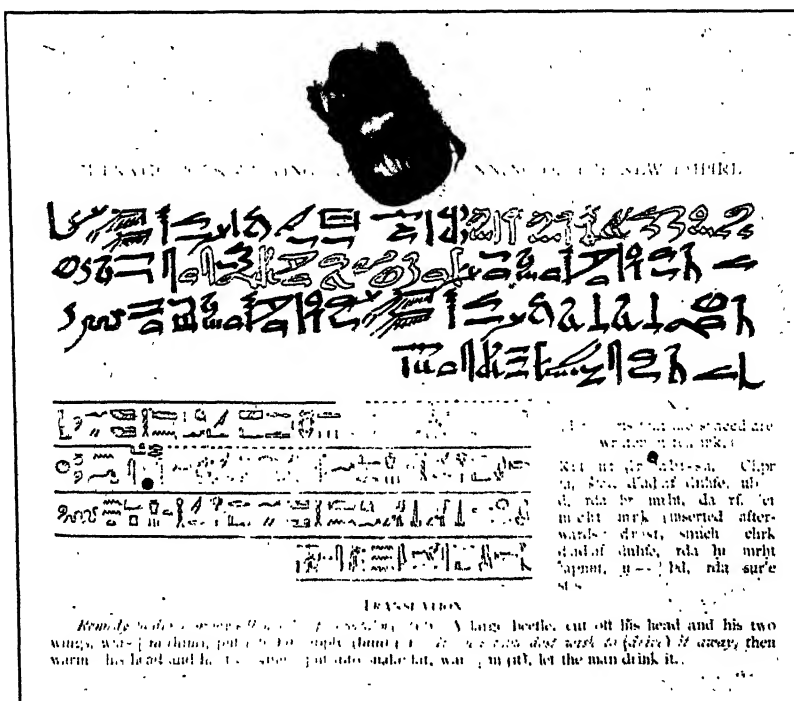


FIG. 15.—PRESCRIPTION FROM THE PAPYRUS EBERS.

sophistication. Its use in modern medicine is as a coloring agent only. Cat. No. 50,222, U.S.N.M.

Fenugreek.—Seeds. Believed to have been an ingredient of the Egyptian preparation kyphi. It is still among the official drugs of some of the European pharmacopoeias. Cat. No. 50,248, U.S.N.M.

Squill.—The bulb of *Urginea maritima*.—Called by the Egyptians the "Eye of Typhon." A highly esteemed remedy for dropsy. Cat. No. 50,259, U.S.N.M.

Galbanum.—A gum resin obtained from *Ferula galbaniflua* Boissou and Buhse, a plant growing in Persia and India. It was an ingredient of the incense used in the form of worship of the ancient Israelites; is mentioned by the earliest Greek medical writers; was well known to the Arabians under the name of "kinnah," and is still recognized by many of the European pharmacopoeias. Cat. No. 50,533, U.S.N.M.

Flaxseed.—The seed of *Linum usitatissimum*, common flax. The seed was used for food by the Egyptians, Greeks, Romans, and other ancient peoples. Cat. No. 51,380, U.S.N.M.

Sesame.—The seeds of *Sesamum indicum*, native of India, cultivated in all warm countries. The Egyptian name, "Semsent," occurs in the Papyrus Ebers, from which name is derived the Coptic "Semsem," the Arabic "Simsim," and the modern "Sesamum." Largely consumed as food; the oil is used for the same purposes as olive oil. The leaves are mucilaginous. Cat. No. 52,162, U.S.N.M.

Lign-aloes.—The fragrant resinous wood of the eagle tree of India, *Aquillaria agallocha*. Used as incense, and in embalming the dead. "All thy garments smell of myrrh, and aloes and cassia." Psalms, xlv, 8. "How goodly are thy tents, O Jacob, and thy tabernacles, O Israel. As the valleys are they spread forth, * * * as the trees of lign-aloes which the Lord hath planted * * *." Numbers, xxiv, 5-6. Cat. No. 52,173, U.S.N.M.

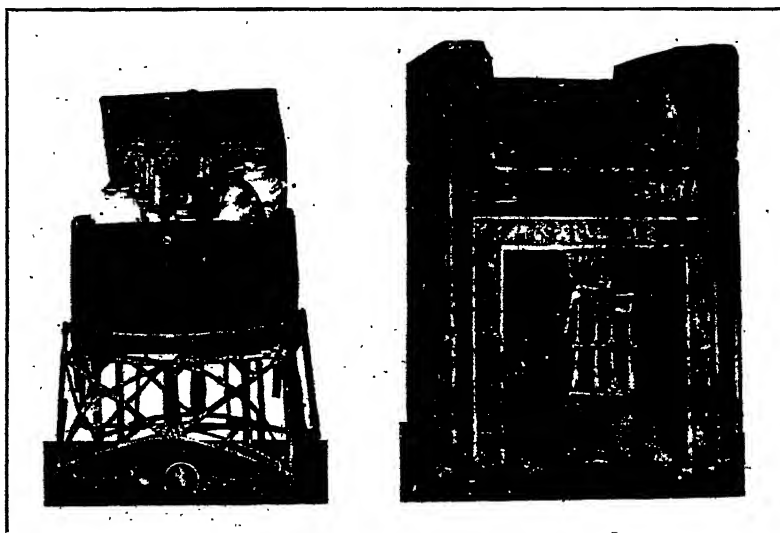


FIG. 16.—EGYPTIAN MEDICINE CHEST AND STONE CASE.

Castor-oil seeds.—The seeds of *Ricinus communis*, native of India, early cultivated in Egypt. The seeds have been found in ancient Egyptian tombs. The plant is believed by some to be the same mentioned in the book of Jonah, iv, 6, under the name of "gourd." The plant was introduced from Egypt into Greece where the oil of the seeds was used extensively in medicine, as well as for burning in lamps. Cat. No. 52,177, U.S.N.M.

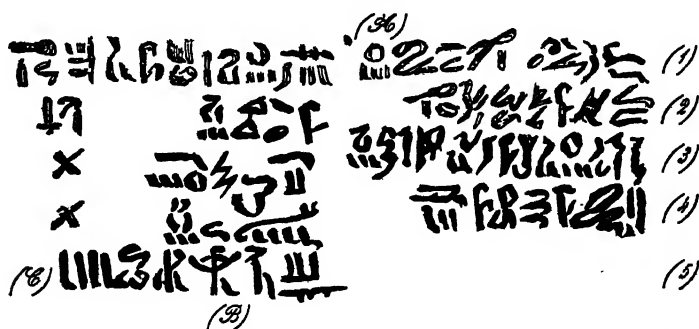
Barley.—The seeds of *Hordeum hexastichon*, indigenous to western Asia; cultivated everywhere. It is mentioned in the Bible as a cultivated grain in Egypt and Syria. Cat. No. 52,393, U.S.N.M.

Cyperus.—The root of various species of *Cyperus*. Used by the Egyptians for snake bites and for the retention of urine; bruised or mixed with wine or vinegar it was applied as a poultice. Cat. No. 52,521, U.S.N.M.

Pomegranate.—The rind of the fruit of *Punica granatum*, a low tree grown in India, Palestine, and neighboring countries. There are many representations of the fruit on the ancient monuments of Egypt, and it is frequently

referred to in the Scriptures. The pulp of the fruit is edible; the peel is an efficient astringent. Cat. No. 52,535, U.S.N.M.

Frankincense.—A fragrant gum resin obtained from various species of *Boswellia* trees, natives of eastern Africa and southern Arabia. Paintings, dating from the seventeenth century B. C., illustrating the traffic in this drug, have been found in the temples of Upper Egypt. It was one of the gifts of the Magi to the infant Saviour. It was, and still is, an essential ingredient of "incense" as used in religious ceremonies. Fumigation with fragrant drugs, of which frankincense was one of the most important, was one of the principal remedial and preventive measures in the treatment of disease by the ancient Egyptians and Hebrews. Cat. No. 52,559, U.S.N.M.



THE ABOVE TRANSLATED INTO THE HIEROGLYPHIC CHARACTER.

		(1)
<i>Medicine for opening the bowels</i>	<i>Beginning of the Book of the Medicine</i>	
		(2)
<i>Milk</i>	<i>To cure the sickness of the bowels</i>	
		(3)
<i>Nebaut (?) Pulverized Adrachme</i>	<i>(seeds of the) The halfpint rubbed up with Vinegar</i>	
		(4)
<i>Honey</i>	<i>To be drunk by the patient</i>	
		(5)
<i>Cook flour out, eat for four days.</i>		

FIG. 17.—FIVE LINES FROM THE PAPYRUS EBERS, WITH TRANSLATIONS INTO HIEROGLYPHIC CHARACTERS AND INTO ENGLISH.

Coriander.—The fruit of *Coriandrum sativum*. The knowledge of this drug is of very great antiquity, being mentioned in the Papyrus Ebers, and by the early Sanskrit writers, as well as in the Bible. It was used both as a condiment and a medicine. Cat. No. 52,659, U.S.N.M.

Medicine vials.—Made by the inhabitants of Palestine. Used for dispensing medicines. (Fig. 18.) Cat. No. 143,168, U.S.N.M.

Gum arabic.—A gummy exudation from various species of *Acacia*. It is recorded that this drug was an article of Egyptian commerce as early as the seventeenth century, B. C. Cat. No. 52,811, U.S.N.M.

Balm of Gilead.—An aromatic resin which flows from the trunk of *Commiphora opobalsamum*. Used for its perfume as well as its healing virtues.

"Is there no balm in Gilead; is there no physician there? Why then is not the health of my people recovered?" Jeremiah viii, 22. Cat. No. 53,380, U.S.N.M.

Myrrh.—A gum resin. This was one of the many constituents of the celebrated kyphi of the Egyptians, used in fumigations, medicine, and the process of embalming. It was an ingredient of the "holy oil" of the Jewish ceremonial as directed by Moses. It is also mentioned in the Bible among the articles used in the purification of women, as an emblem of purity, as a perfume, and one of the substances used in embalming. Cat. No. 141,681, U.S.N.M.

Cumin.—The fruit of *Cuminum cyminum*, indigenous to the region of the upper Nile, early cultivated throughout the east. It is well known to the ancients and is mentioned in both the Old and the New Testament. It was one of the most commonly used spices during the Middle Ages and is found in the drug markets of the present time. Cat. No. 142,259, U.S.N.M.

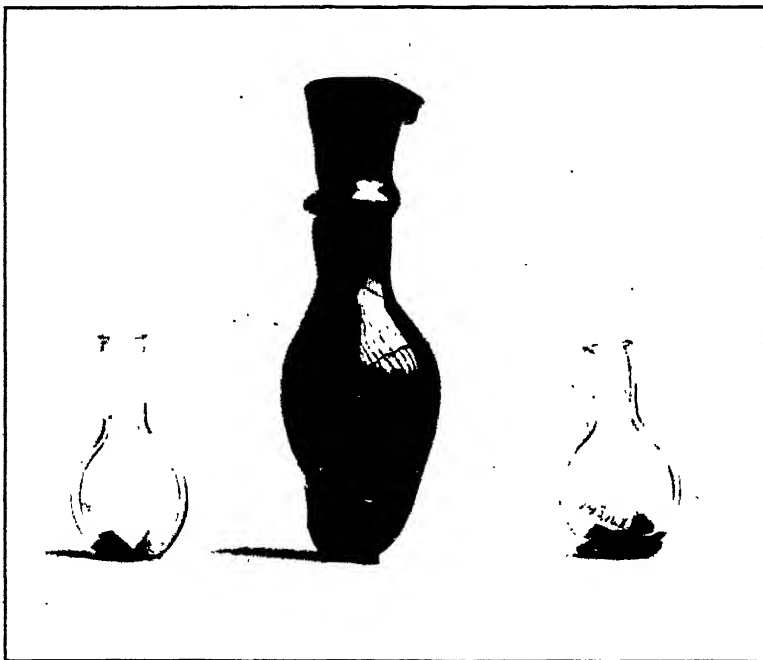


FIG. 18.—MEDICINE VIALS.

Almonds.—The seeds of the almond tree, *Prunus amygdalus*, native of western Asia, early introduced and cultivated in northern Africa and southern Europe. Mentioned in the Book of Genesis (xliii, 11) where it is stated that the patriarch Israel commanded his sons to carry with them into Egypt a present consisting of the productions of Palestine, one of which was almonds. Cat. No. 143,197, U.S.N.M.

Figs.—The fruit of *Ficus carica*, native of western Asia, extensively cultivated. The fig tree is the first plant mentioned by name in the Bible (Genesis iii, 7). The fruit was an important article of food for the Hebrews and was also used medicinally. "For Isaiah had said, let them take a lump of figs and lay it for a plaister upon the boil, and he shall recover." Isaiah xxxviii, 21. Cat. No. 143,198, U.S.N.M.

GREEK AND ROMAN MEDICINE

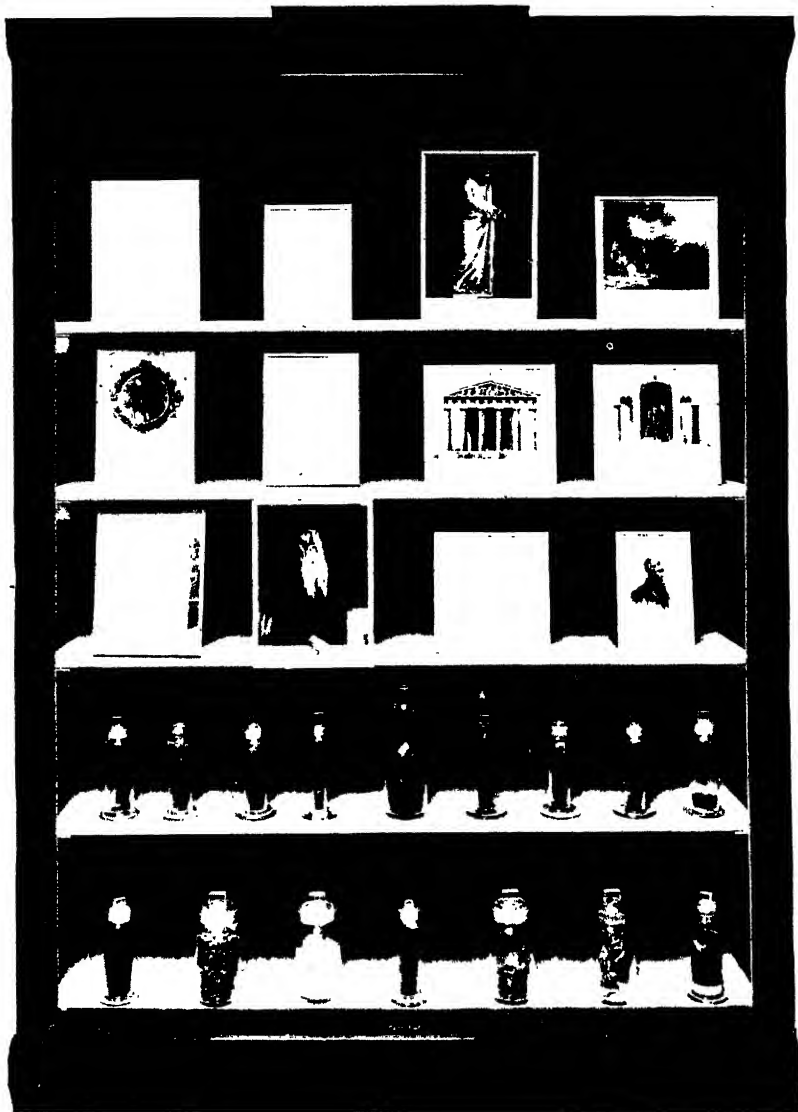
The primitive period of Greek medicine is mostly mythical. It begins with Melampus (about 1,400 years B. C.) and ends with Hippocrates (460 B. C.). The most prominent character during this period was Aesculapius, reputed son of Apollo and Coronis. As the god of medicine he was worshipped by Greeks and Romans everywhere. Temples were erected in his honor and served by a priesthood of his descendants, called Asclepiadae. The sick were brought to these temples, prayers and sacrifices offered, and treatment prescribed as indicated by dreams or signs given in answer to the prayers and sacrifices. Records of the cases, symptoms, treatment, and results were carved upon votive tablets and hung upon the walls of the temple.

The philosophic period began with Hippocrates (born 460 B. C.), believed to be the seventeenth in descent from Aesculapius. He is styled "The Father of Medicine," and it is justly said of him that "the medical art as we now practice it, the character of the physician as we now understand it, both date for us from Hippocrates." He separated medicine from priestcraft; taught that disease was a process governed by natural laws, and that the clew to proper treatment was to be found in minute observations of its symptoms and natural course. Surgery had already made much progress. Among the surgical operations recorded are reduction of dislocations and fractures, resection of bones, trephining, opening of abscesses of kidneys and liver, operation for fistula and hemorrhoids, operations on club feet, and sounding the bladder for stone.

After Hippocrates came many celebrated Greek physicians noted as authors and founders of various "schools" of theoretical medicine, such as "humoralist," "solidist," "vitalist," "empiricist," etc. The most eminent of these later Greek physicians, and one whose influence was most widespread and continuous, was Galen (born 130 A. D.). He was a brilliant orator and voluminous writer, and the tendency of his teachings was to harmonize the conflicting doctrines of the several schools and to develop the more simple teachings and methods of Hippocrates. His works were authoritative down to a comparatively recent period.

Dioscorides (born about 77 A. D.) was the most renowned writer on materia medica. He makes mention of about 90 minerals, 700 plants, and 198 animal substances.

Rome neither originated nor possessed an independent school of medicine. Early Roman medicine was founded on superstition and practiced by magic arts. Later it was controlled by Greek physicians, though as a branch of philosophy it was expounded by Roman teachers and writers.



EXHIBITS OF GREEK AND ROMAN MEDICINE

FOR DESCRIPTION OF PLATE SEE PAGE 30

Aesculapius.—The Greek God of Medicine, son of Apollo and the nymph Coronis. His mother was slain by his father, and Aesculapius was given to the centaur, Chiron, to be reared and educated. Under Chiron's instruction Aesculapius became marvellously skilled in medicine, not only healing the sick, but raising the dead. On the complaint of Pluto that Aesculapius was desolating the realms of the shades, Jupiter slew him with his thunderbolt, but at the request of Apollo he was placed among the stars. He was worshipped as a god, and numerous temples were erected for his services, conducted by priests called Asclepiadae. (See fig. 21.) Cat. No. 143,513, U.S.N.M.

Chiron.—From an engraving of a wall painting in Pompeii. The most celebrated of the centaurs, son of Saturn and the nymph, Philyra. The legend is



FIG. 19.—CHIRON.

that Saturn dreading the jealousy of his wife, Rhea, transformed Philyra into a mare and himself into a steed; the offspring was Chiron, half man and half horse. Having been instructed in hunting, gymnastics, music, and medicine, he became the instructor of others in these arts and accomplishments, especially Aesculapius and Achilles in medicine (fig. 19). Cat. No. 143,513. U.S.N.M.

Machaon.—Machaon and his brother Podalirius, sons of Aesculapius, were next to their father, the most noted physicians in the legendary Greek period. They were equally celebrated as warriors, and made themselves so conspicuous by their valor that Homer ranks them among the first of the Greek

heroes. They commanded a division of the Greek fleet in the Trojan War, being the first doctor admirals on record. Machaon was one of the heroes of the wooden horse, and is supposed to have lost his life on that occasion. After his death he received divine honors, and a temple was erected in his honor. (See pl. 5.) Cat. No. 143,516, U.S.N.M.

The Hieron or sacred place at Epidaurus.—This enclosure contained, besides the temple for the worship of Aesculapius, a propylea or gateway, a gymnasium, the abaton or sleeping place for the pilgrims, the tholos, a circular building of which the uses are unknown, a stadium or race course, and several other buildings of doubtful utility. These sacred places were usually located on wooded slopes, or about medicinal springs. Within them no dying person nor parturient woman was allowed to remain. The temples erected to Aesculapius were not only places for worship by prayers, sacrifices, etc., but also places where the sick could make personal application to the divine physician for counsel or cure. The ceremonies were under the direction of

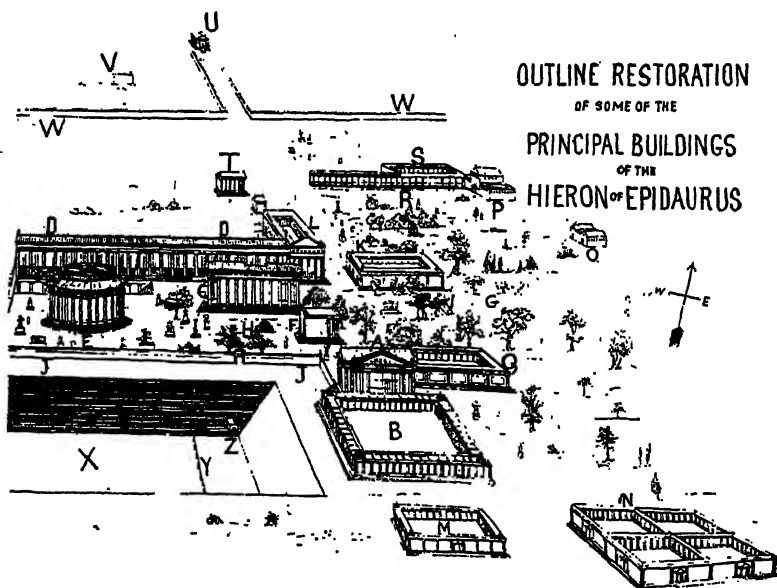


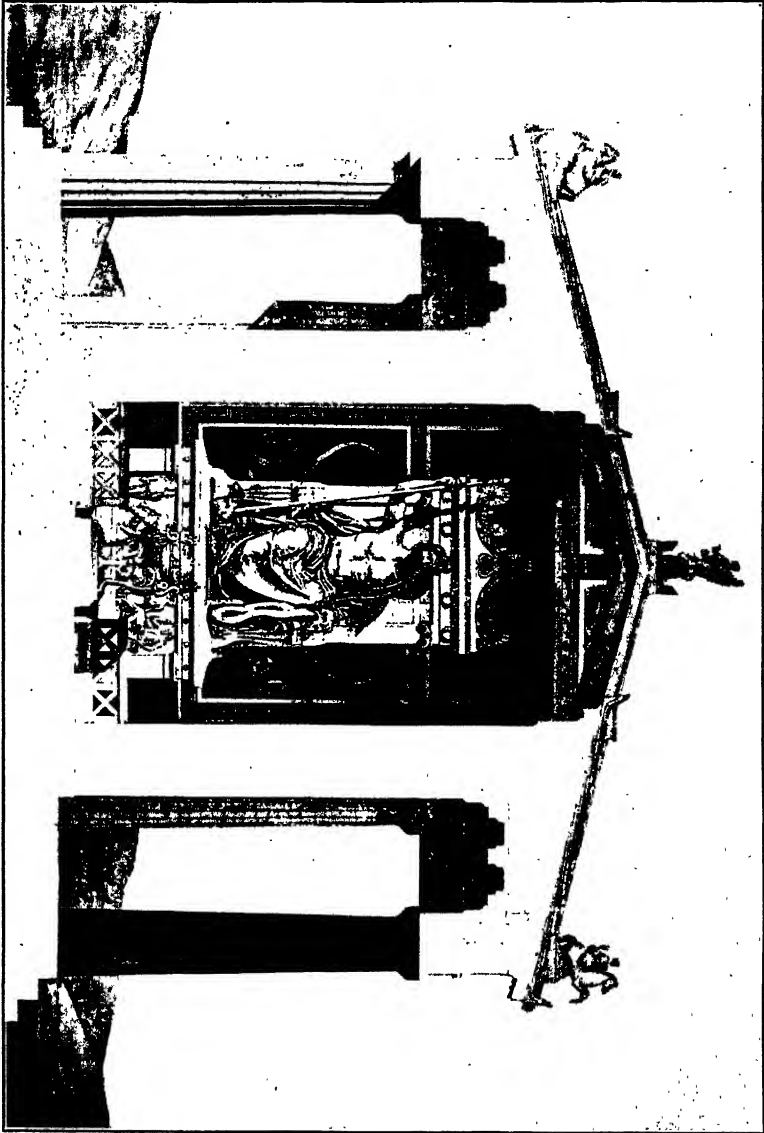
FIG. 20.—THE HIERON OR SACRED PLACE AT EPIDAUROS. OUTLINE RESTORATION.

a priesthood called Asclepiads, supposed descendants of Aesculapius. The treatment of the sick was almost exclusively psychic, or mind medicine. It was begun with ablutions, prolonged fastings, prayers, and sacrifices, accompanied with elaborate ceremonials calculated to excite the imagination and inspire hope. After these preparations the patient was put to sleep in the "abaton," and in the dreams which followed the god was supposed to appear and indicate the proper remedy for the disease. The patient was aided in the interpretation of the dream by the priest. If the treatment was successful the case was recorded upon stone or metal columns or tablets, for the information of others. Metal or ivory models of the part affected were hung on the walls of the temple, as is the custom in many countries at the present day. (See fig. 20 and pl. 5.) Cat. Nos. 143,517 and 143,518 U.S.N.M.

Statue of Aesculapius.—The statue of Aesculapius shown in Figure 21 was made of ivory and gold, by the sculptor Thrasymedes. It represents a handsome figure seated on a throne, holding in one hand a staff, the other hand

resting upon a serpent, and lying by his side, a dog. The serpent and the dog are satellites of Aesculapius, and living specimens of these animals were kept in the temples, and sometimes played a part in the miraculous cures. The serpent, son of the earth, living in the bosom of the earth, symbolizes

FIG. 21.—THE TEMPLE OF AESCULAPIUS AT EPIDAUROS. TRANSVERSE SECTION SHOWING THE STATUE OF AESCULAPIUS.



secret and mysterious powers. Its habit of shedding its skin every year makes it a symbol of rejuvenation. The Romans, during a pestilence (B. C. 293), sent a solemn embassy to Epidaurus to obtain the sacred serpent kept in that temple, hoping thereby to stay the plague.

Copy of memorial tablet.—It was the custom, in the early Greek period, to commemorate notable cures by a record of the cases engraved upon tablets of metal or marble. The tablet represented in Figure 22 bears the record of four cases, two of blindness, one of hemorrhage from the lungs, and one of pleurisy. It illustrates the fact that the medical practice in the Greek temples was purely psychic, or mind medicine, a method as old as history. Translated into English the records on the memorial tablet read as follows:

(1) Lately a certain Gaius, who was blind, learned from the oracle that he should approach the altar, offering prayers, then cross the temple from right to left, place his five fingers upon the altar, raise his hand and place

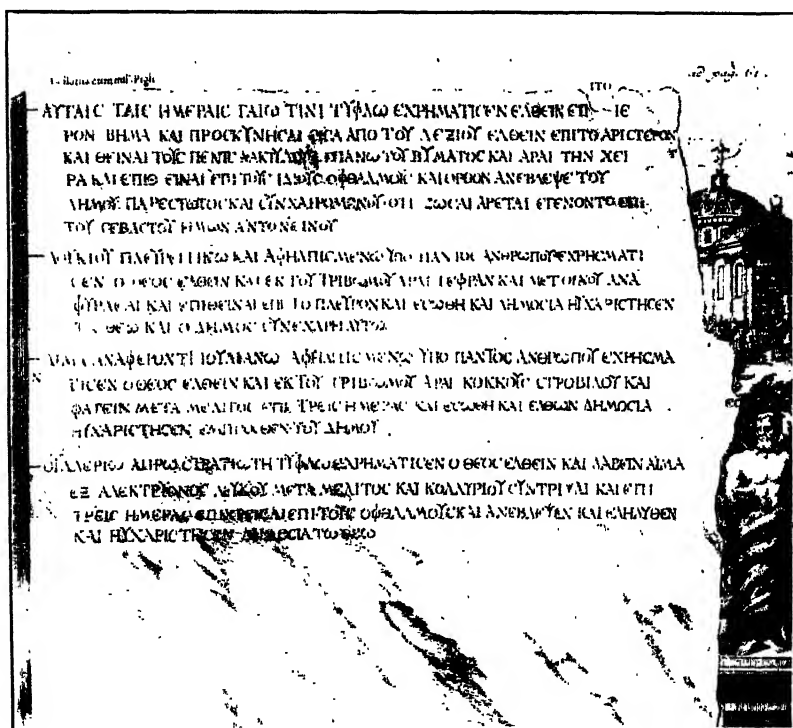


FIG. 22.—COPY OF A MEMORIAL TABLET FOUND ON THE SITE OF A TEMPLE OF AESCULAPIUS ON THE ISLAND OF THE TIBER AT ROME.

it upon his eyes. He recovered his sight at once, in the presence and amid the applause of the people. This evidence of the omnipotence of the god was manifested during the reign of Antoninus (about 120 A. D.).

(2) A blind soldier named Valerius Aper, having consulted the oracle was directed to mix the blood of a white cock with honey, and make of it an ointment which he was to rub on the eyes for three days. He recovered his sight and went to thank the god before all the people.

(3) A certain Julian was given over by all because of a spitting of blood. The oracle directed him to go to the altar, thence take some pine nuts, mix them with honey, and eat of them for three days. He was saved, and returned to give thanks to this god, in the presence of all the people.

(4) The son of Lucius was attacked with a pleurisy and his life was despaired of. The god, who appeared to him in a dream, ordered him to take ashes from the altar, mix them with wine, and apply to his side. He was saved, and came to thank the god before all the people, who wished him all

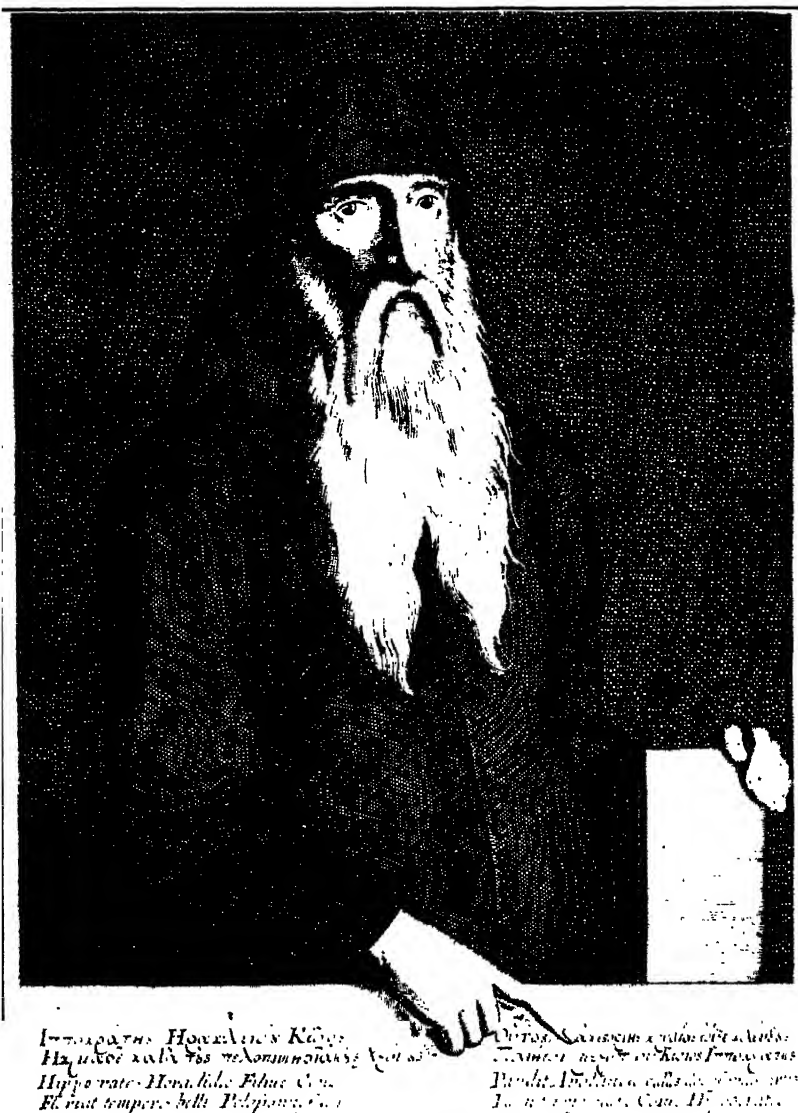


FIG. 23.—HIPPOCRATES.

kinds of prosperity. (See Hundertmarck, "De Incrementis Artis Medicæ") Cat. No. 143.519, U.S.N.M.

Hippocrates.—Called the "Father of Medicine." Born on the Island of Cos in the year 460 B. C. He belonged to the family of the Asclepiadae, a gild of priest-physicians reputed to be descendants of Aesculapius, from whom

he was believed to be the seventeenth in lineal descent. Before his time medicine was almost exclusively theurgic, or magical. Hippocrates was the first to separate medicine from superstition and priestcraft, to base its practice upon the principles of inductive philosophy, and direct especial attention to the natural history of disease. He laid great stress upon regimen, and was the first to enunciate the principles of public health. He wrote voluminously

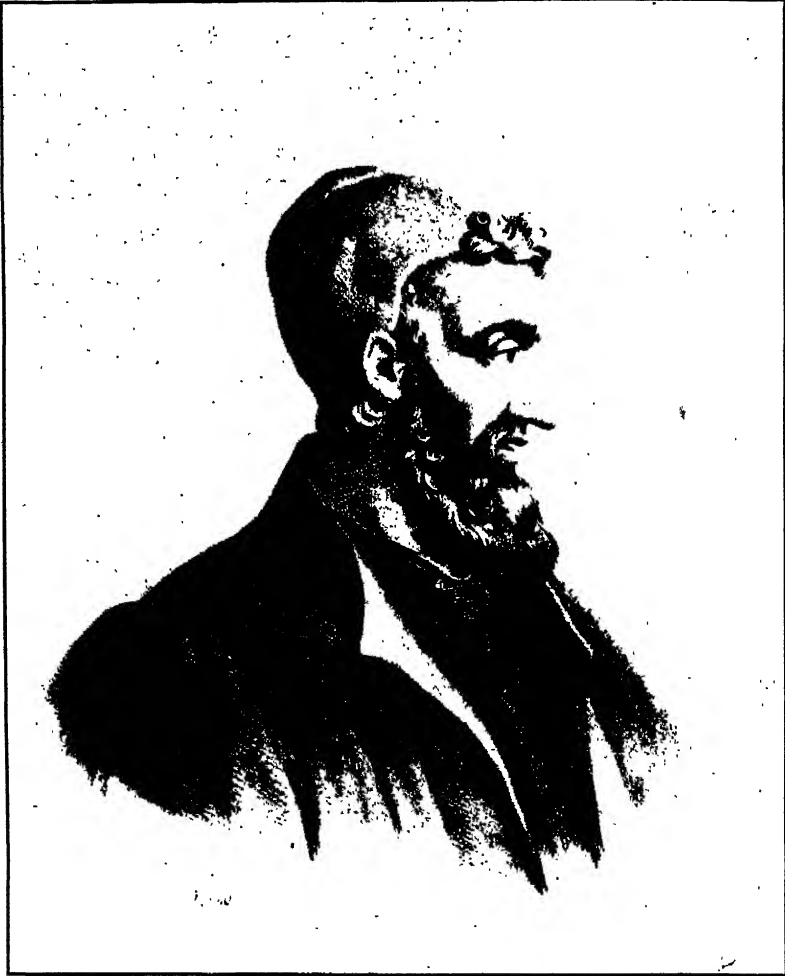


FIG. 24.—CLAUDIUS GALEN.

upon various subjects relating to medicine, and his works have been reproduced in many languages and editions. (Fig. 23.) Cat. No. 143,520, U.S.N.M.

Hippocratic oath.—A form of oath said to have originated with Hippocrates, and to have been required of all his pupils. Possibly it antedates his time, as it is believed by some historians to have been administered to the pupils of the schools of the Asclepiadae. Whatever its origin it stands as a remarkable testimonial to the high standard set for the physician of that early period.

Certainly from the time of Hippocrates (460 B. C.) to the present it has been administered or read to the graduates of medical schools, as a classical expression of the high moral principles which should govern the physician in his personal conduct, and in his relations toward his patients.

"I swear by Apollo, physician, by Aesculapius, by Hygeia and Panacea, by all the gods and all the goddesses—taking them to witness—that I will fulfill with my strength and my capacity this oath and engagement: I will place my master in medicine in the same rank with the authors of my life; I will share with him my fortune, and in necessity I will provide for his wants; I will regard his sons as brothers, and if they desire to learn medicine, I will teach them without pay. I will communicate my precepts, my oral lessons, and all other instruction to my sons, to the sons of my master, and to those disciples who are bound by an engagement and an oath according to the medical law, but to no others. I will direct the regimen of my patients for their advantage, to the best of my ability and judgment. I will abstain from all wrong and injustice. I will not furnish poison to anyone who solicits it, neither will I make a suggestion of it to any one; neither will I furnish to any woman an abortive. I will pass my life, and I will exercise my art, in innocence and purity. I will not perform the operation of lithotomy, but will leave it to those who occupy themselves therewith. Into whatsoever house I enter, it shall be for the good of my patients, keeping myself from all corrupting conduct, and especially from the seduction of women and boys, free or slaves. Whatever I see or hear in society, in the exercise, or even not in the exercise, of my profession, I will keep secret, if it is not necessary to divulge it, regarding discretion as a duty in all such cases. If I fulfill this oath, without violation, may it be given me to enjoy happily life and my profession, honored forever among men; if I violate it and perjure myself, let the opposite fate be my lot." Cat. No. 143,521, U.S.N.M.

Glaucius Galen.—Next to Hippocrates, the most illustrious of the ancient physicians. Born at Pergamos, Asia Minor, (130 A. D.) son of the celebrated architect Nicon. He began the study of medicine at 16, and when 20 years of age he placed himself under the instruction of eminent physicians at Smyrna, Alexandria, and elsewhere. In the year 164 he went to Rome, where he gained great renown for his skill in medicine, and also aroused the bitter jealousy of his rivals. His vast learning, his eloquence, his voluminous writings on medicine, philosophy, geometry, and grammar, gained for him the greatest admiration and almost religious veneration. Galen was an enthusiastic admirer of Hippocrates, and used all the power of his genius and the influence of his name to bring back the practice of medicine to the foundation laid for it by Hippocrates in the study of the natural history of disease. The writings of Galen continued to have almost undisputed authority in medical practice down to the sixteenth century. (Fig. 24.) Cat. No. 143,522, U.S.N.M.

MATERIA MEDICA OF THE ANCIENT GREEKS AND ROMANS.

"About 800 years separated the periods of Aesculapius and Hippocrates. * * * Leclerc has collected a list of nearly 400 simples which he finds alluded to as remedies in the writings of Hippocrates. But these include various milks, wines, fruits, vegetables, fats, and other substances which we should hardly call drugs now. Omitting these and certain other substances which can not be identified I

take from the author named the following list of medicines employed or mentioned in that far distant age:

Abrotanum.	Coriander.	Mecon. (?)
Absinthe.	Crayfish.	Melilot.
Adiantum (Maiden-hair).	Cress.	Mercurialis.
Agnus castus.	Cucumber.	Minium.
Algae (various).	Cummin.	Mints (various).
Almonds.	Cyclamen.	Mugwort.
Althaea.	Cytisus.	Myrabolans.
Alum.	Dictamnus.	Myrrh.
Amber.	Dog.	Myrtle.
Ammoniac.	Dracontium.	Narcissus.
Amomum.	Earths (various).	Nard.
Anagallis (veronica).	Elaterium.	Nitre.
Anagyris.	Elder.	Oak.
Anchusa.	Erica.	Oenanthe.
Anemone.	Euphorbia.	Oesypus.
Anethum.	Excrement of ass, goat, mule, goose, fox.	Olive.
Anise.	Fennel.	Onions.
Anethemis.	Fig.	Origanum.
Aparine (goose grease).	Foenugreek.	Orpiment.
Aristolochia.	Frankincense.	Ostrich.
Armenian stone.	Frogs.	Ox-gall.
Asphalt.	Galbanum.	Ox (liver. gall, urine).
Asphodel.	Galls.	Panax.
Atriplex.	Garlic.	Parthenium.
Bacchar's.	Germander.	Pennyroyal.
Balm.	Goat (various parts).	Peony.
Basil.	Hawthorn.	Pepper.
Bistort.	Heather.	Persea (sebestens).
Blite.	Hellebore.	Persil.
Brass.	Hemlock.	Peucedanum.
Briar.	Henbane.	Phaseolus.
Bryony.	Honey.	Phillistium.
Burdock.	Horehound.	Pine.
Cabbage.	Horns of ox, goat, and stag.	Pitch.
Cachrys.	Hyssop.	Pomegranate.
Calamus aromaticus.	Isatis.	Poppy.
Cantharides.	Ivy.	Quicklime.
Capers.	Juniper.	Quince.
Cardamom.	Laserpitium.	Ranunculus.
Carduus benedictus.	Laurel.	Red spider.
Carrot.	Lettuce.	Resin.
Castoreum.	Licorice.	Rhamnus.
Centaury.	Linseed.	Rhus.
Centipedes.	Loadstone.	Ricinus.
Chalcitis (red ochre).	Lotus.	Rock rose.
Chenopodium.	Lupins.	Rose.
Cinnamon.	Magnesian stone.	Rosemary.
Cinquefoil.	Mallow.	Ruby.
Clove.	Mandragora.	Rue.
Colocynth.		Saffron.
		Sagapenum.

Sage.	Squill.	Trigonum.
Salt.	Stag.	Tribulus.
Samphire.	Stavesacre.	Turpentine.
Sandarach.	Styrax.	Turtle.
Scammony.	Succinum.	Umbilicus veneris.
Sea water.	Sulphur.	Verbascum.
Secundines of a woman.	Sweat.	Verbena.
Sepia.	Tarragon.	Verdigris.
Serpent.	Tetragonum.	Verjuice.
Sesame.	Thaspia.	Violet.
Seseli.	Thistles.	Wax.
Silver.	Thlapsi.	Willow.
Sisymbrium.	Thuja.	Woad.
Solanum.	Thyme.	Worms.
Spurge.	Torpedo (fish).	Worm seed.

This list may be taken to have comprised pretty fairly the materia medica of the Greeks as it was known to them when Hippocrates practiced, and as it is not claimed that he introduced any new medicines it may be assumed that these formed the basis of the remedies used in the temples of Aesculapius, though perhaps some of them were only popular medicines." Chronicles of Pharmacy.—Wootton.

SOME MEDICINAL MATERIALS OF ANCIENT GREEKS AND ROMANS.

VEGETABLE DRUGS.

Mustard.—The seeds of *Brassica nigra*. According to Dioscorides (77 A. D.) as a gargle "it is useful in swelling of the tonsils and chronic roughness of the windpipe. Moistened and put in the nostrils, it excites sneezing, is useful in epilepsy, and arouses women from the paroxysms of hysteria. Mixed with figs and applied until the part becomes very red, it is good for sciatica and all chronic pains in which we seek to draw the humors from within outward, removing the disease from one place to another. Mixed with vinegar, it is a useful application for the itch and ringworm." Cat. No. 50,142, U.S.N.M.

Licorice.—Mentioned by Theophrastus (third century B. C.) as "the sweet Scythian root, good for asthma, dry cough, and all diseases of the chest." The expressed juice, equivalent to the modern "extract," is recommended by Dioscorides for irritation of the bronchial tubes, for burnings in the stomach (heart-burn), and diseases of the chest and liver. Taken with wine for irritation of the bladder and kidneys. Applied, in solution, as a healing lotion for wounds, and, in powder, for the cure of excrescences upon the eyelids. Cat. No. 50,154, U.S.N.M.

Staphisagria.—The seeds of *Delphinium staphisagria*. It was one of the medicines of Hippocrates, and was used, as now, for the destruction of vermin infesting the human body. Like many other violently irritant medicines it was used internally as well as externally. "In the dose of 10 or 15 grains, taken with honey and water, it purges the gross humors by vomiting. One who has taken it should walk about, and continue the hydromel, for it produces a feeling of suffocation, and burns unceasingly the throat." Dioscorides (first century A. D.). Cat. No. 50,367, U.S.N.M.

Maidenhair fern.—The fronds of *Adiantum capillus veneris*. Used as a remedy for croup. Cat. No. 52,445, U.S.N.M.

Carpobalsamum.—The dried fruit of a small evergreen tree growing on the shores of the Red Sea. It was in high repute with the ancients as a medicine and cosmetic. Cat. No. 52,564, U.S.N.M.

Lycium.—An extract prepared from the Indian barberry. It was held in great esteem by the Greeks and Romans, and vases made especially for containing it, bearing the name "Lycion," have been found in the ruins of Grecian cities. It was particularly valued as a collyrium in the treatment of ophthalmia. Given internally for dysentery, cough, hemorrhage from the lungs; taken with milk, for cure of hydrophobia. Cat. No. 52,571, U.S.N.M.

Tragacanth.—A gum exuding from various species of *Astragalus*. The drug is mentioned by Theophrastus (third century B. C.) and by other Greek physicians. "A useful ingredient of medicines for cough and roughness of the throat. Dissolved in wine, and mixed with a little calcined hartshorn or burnt alum, it is taken for pains of the kidneys and irritation of the bladder." Dioscorides. Cat. No. 52,775, U.S.N.M.

Hellebore.—The root of *Helleborus niger*. According to tradition, Melampus (1400 B. C.), cured the daughters of Proetus, King of Argos, of hysterical mania by the use of hellebore. Cooked with lentils or other broth, it was taken as a purgative. Used in gout, rheumatism, and insanity. Applied in form of plaster for dropsy. Scattered about houses to purify them from everything injurious. When about to uproot the plant, prayers were offered to Apollo and Aesculapius, and great care was taken lest an eagle should witness the operation, in which event the gatherer of the plant would surely die.—Dioscorides. Cat. No. 141,632, U.S.N.M.

Euphorbium.—A gum resin obtained from incisions made in the branches of *Euphorbia resinifera*. The collection of the drug was described by Dioscorides and Pliny and is mentioned by Galen and other early Greek writers. "The aqueous infusion applied to the eye resolves cataract. Taken with an aromatic drink it relieves the pain of sciatica. For snake bite, it is recommended to incise the skin of the head, introduce a little euphorbium and sew up the wound."—Dioscorides. Cat. No. 143,169, U.S.N.M.

Conium.—The expressed juice of the tops of *Conium maculatum*. It was a common plant in Greece, and classed among the deadly poisons. Used medicinally as a constituent of collyria to relieve pain and for plasters for wounds and erysipelas. In the treatment of poisoning by conium, emetics and purgatives were used, and as an antidote "pure wine." Among the Athenians the administration of this drug was the common mode of capital punishment, the execution of Socrates by this method being one of the notable events of Greek history. The drug was given in wine, and the victim required to walk about in order to promote its circulation throughout the body. Cat. No. 143,174, U.S.N.M.

MINERAL DRUGS

Alum.—"Alum cleanses the eye from everything that tends to obscure the vision, dissipating granulations of the lids and consuming any other excrescences. It arrests hemorrhage, contracts lax gums, and, with vinegar or honey, fixed loosened teeth. Mixed with honey it is good for ulceration of the mouth; with the dregs of vinegar and an equal quantity of the ashes of galls it is efficacious in chronic and corroding ulcers. In form of ointment it removes dandruff, and if applied with water it is a remedy for lice and nits and for burns."—Dioscorides. Cat. No. 50,168, U.S.N.M.

Rust of iron.—According to Apollodorus, Iphycus, one of the Argonauts, was cured of impotence by iron rust dissolved in wine. Iron preparations were

used at the time of Hippocrates and among the Romans at the beginning of the Christian era. Cat. No. 141,807, U.S.N.M.

Lemnian earth.—An aluminum silicate containing iron, found native in the Island of Lemnos. Does not differ from the Armenian bole except in the proportion of iron oxide. "It is collected by the inhabitants of the island, and after being washed and mixed with goat's blood it is formed into pastilles and marked with a seal. Taken with wine it is a potent remedy for deadly poisons, is an antidote for the stings and bites of venomous animals, and is useful in dysentery."—Dioscorides. Cat. No. 143,171, U.S.N.M.

Sulphur.—Administered in form of fumigation for cough, asthma, and accumulation of phlegm in the chest. Mixed with turpentine, it removes ring-worm, smooths asperities of the skin, and extirpates injured nails. Applied with resin, it heals the stings of the scorpion and those of the sea dragon. Friction with sulphur and niter relieves itching of the whole body. Applied to the forehead in powder or with white of egg, it cures jaundice and catarrh. In powder sprinkled upon the body, it checks perspiration. The fumes of sulphur received in the eyes through a reed cures blindness.—Dioscorides.

ANIMAL DRUGS

Viper.—"The flesh of the viper, cooked and eaten, sharpens the sight, is good for nervous debility, and resolves scrophulous tumors. The head and tail of the viper should be cut off before cooking; but to say that these extremities must be cut off according to a certain method I hold to be fabulous. The rest of the body, after evisceration, should be cooked with oil, wine, dill, and a little salts. Some say that those who eat vipers' flesh become very lousy, but that is false; others say that they are longer lived."—Dioscorides. Cat. No. 143,170, U.S.N.M.

Crab.—"The ashes of the burned crab, given with wine for a period of three days, in a dose of two spoonfuls, with a spoonful of gentian, is helpful to those bitten by a mad dog. Applied with honey it relieves cracks of the feet and anal fissure, and is a remedy for chilblains and cancer. The powdered shell, taken with asses' milk, is good for snake and scorpion bites."—Dioscorides. Cat. No. 143,175, U.S.N.M.

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SYNOPSIS OF THE NORTH AMERICAN FLIES OF THE GENUS *Scellus*.

By CHARLES T. GREENE,

Of the Bureau of Entomology, United States Department of Agriculture.

INTRODUCTION.

This synopsis is based on a large series of specimens. The location of the type is designated under each species where it is known.

I wish to acknowledge my thanks to Dr. J. M. Aldrich for his criticism; to C. W. Johnson for the records which he supplied; to Nathan Banks for the loan of a species from the collection of the Museum of Comparative Zoology at Cambridge, Massachusetts; and to Dr. A. L. Melander who loaned me all his material of this genus. Doctor Aldrich donated the type material of several species to the national collection.

HISTORICAL OUTLINE OF THE GENUS.

The genus *Scellus* was established by Loew in 1857¹ with the two species *Hydrophorus notatus* Zetterstedt and *Hydrophorus spinimanus* Zetterstedt. Coquillett in 1910² designated *Hydrophorus spinimanus* Zetterstedt as type of the genus.

The three genera *Scellus*, *Hydrophorus*, and *Liancalus* form a distinct subfamily of the Dolichopodidae and are characterized by having the last section of the fifth vein shorter than the posterior cross-vein, the hairs on the back of the head below forming a scattered beard (instead of a ruff in a single row bordering the eye), the hypopygium is directed backward or downward, not turned forward under the venter.

Liancalus is easily separated by having slender fore femora and elongated fore coxae. *Hydrophorus* and *Scellus* are more closely related but can be easily separated. *Scellus* has long spines on the under side of the fore femora and distinct, narrow, longitudinal lines on the dorsum of the thorax. *Hydrophorus* has only small spines on the under side of the fore femora, and the dorsum of the thorax unmarked with the longitudinal lines. Sometimes there is a very faint trace of these lines.

¹ Neue Beiträge, 1857, pt. 5, p. 22.

² Type-species of the North American Diptera, Proc. U. S. Nat. Mus., 1910, vol. 37, p. 603.

The species of *Hydrophorus* always frequent the edges of water and are often seen running over its surface. *Scellus* is never seen at water, but is found on the bark of trees, on the ground, or in grass. *Liancahus* is found on rocks in cold wet places.

The males of *Scellus* can be divided into two groups. The male appendages are ribbonlike. In one group the appendage has a spoonlike enlargement at the apex, while the other group is without this enlargement at the apex.

KEY TO MALES.

1. Third joint of antenna very long pointed..... No. 1, *virago* Aldrich.
Third joint of antenna very short..... 2
2. Caudal appendage ribbonlike, with a spoonlike enlargement at the apex 3
Caudal appendage without an enlargement at the apex..... 6
3. Spoonlike tip of appendage infuscated..... 5
Spoonlike tip of appendage not infuscated..... 4
4. Spoonlike tip of appendage pale; hind femur very thick, strongly curved at base with a cluster of short, thick spines on the underside,
No. 2, *exustus* (Walker).
Spoonlike tip of appendage light ochre yellow; hind femur straight, slender,
No. 3, *spinimanus* (Zetterstedt).
5. Hind tibia with two large, spinelike bristles at the apex, the larger one bent like a corkscrew..... No. 4, *monstrosus* Osten Sacken.
Hind tibia normal; front tibia notched near the apex, terminating into an oblique point..... No. 8, *avidus* Loew.
6. Caudal appendage with an enlargement near the middle,
No. 6, *amplus* Curran.
Caudal appendage without enlargement..... 7
7. Appendage short, whitish on apical half, infuscated on basal half; hind femur with pale, villous hairs on inner surface near middle,
No. 5, *vigil* Osten Sacken.
Appendage nearly as long as the abdomen, pale, infuscated at extreme base; hind femur without villous hairs..... No. 7, *aliferus* Loew.

KEY TO FEMALES.

1. Third joint of antenna very long and narrow..... *virago* Aldrich.
Third joint of antenna short..... 2
2. Shining, metallic, large species..... 3
Dull metallic surfaces heavily dusted, smaller species..... 5
3. Halteres brownish-black, pale at base; legs bronze-black, sub-shining,
exustus (Walker).
Halteres pale; legs not as above..... 4
4. Legs shining, dark metallic green; abdomen shining with metallic green reflection..... *monstrosus* Osten Sacken.
Legs sub-shining with a deep reddish-bronze reflection; abdomen with deep reddish-bronze reflection..... *avidus* Loew.
5. Front tibia with four long, macrochaetae on under side,
spinimanus (Zetterstedt).
Front tibia with two long macrochaetae on under side..... 6
6. Front tibia with two macrochaetae of equal length on the front side near the middle..... *amplus* Curran.
Front tibia with two macrochaetae of unequal length..... 7
7. Femora metallic green..... *aliferus* Loew.
Femora bronze, with reddish tinge..... *vigil* Osten Sacken.

1. *SOELLUS VIRAGO* Aldrich.

Plate 1, fig. 8; plate 2, figs. 15 and 19; plate 3, fig. 28.

Soellus virago ALDRICH, Entomological News, 1907, April, p. 138.

"Large species, with yellowish-brown wings and greatly elongated antennae, with apical arista."

"*Male*.—Head densely yellowish-brown pollinose, the face more ochre yellow; eyes elongated vertically, the face slender; about eight black bristles behind the eye above, and a pair on the occiput; antennae inserted higher up, as long as the vertical diameter of the eye, slender, the third joint nearly twice as long as the first two, with a short two-jointed, apical arista.

"Thorax thickly dusted, still with a faint coppery or rosaceous reflection showing through on dorsum and sides. Pollen of the dorsum grayish in the middle, with two very fine lines in the center, inclosing the single row of six or eight tiny, acrostichal bristles; dorsocentral bristles in two rows, very small except the posterior two of each row, with slight dots from which the separate bristles arise; along each side of the dorsum a darker pollinose stripe above the pleural suture; before the scutellum a median darker stripe, continuing the two fine median lines to the scutellum (the insertion of the pin prevents my describing this more closely); scutellum more bright coppery red, with two bristles; pleura uniformly and densely pollinose with gray, the coppery ground color but little visible. Halteres yellow.

"Abdomen less pollinose and more coppery than the thorax, of four well-developed segments, the others modified; fourth segment one-third as long as the preceding one; the 'anal appendages' arise on the dorsal side between the fourth and fifth segments they are a pair of delicate organs, black at base, whitish beyond, each ending in a spoon-shaped, orange-colored enlargement, which bears a dense series of small, dark hairs along the outer side and a tuft of similar ones on the inner apical angle; third abdominal segment protuberant below, the grasping organs of the hypopygium projecting behind it.

"Legs blackish-green, somewhat pollinose, of complicated structure. Fore femora with the usual spines beneath; fore tibiae with a row of stiff hairs on the inner side beyond the middle and a stout thumblike curved claw on the anterior side before the end; also, with a striking lobe or lappet on the inner side of the tip. Middle femora slender, a little arcuated; middle tibiae with a row of erect bristles on the anterior side past the middle, and curled long hairs on the posterior side at the tip. Hind femora, tibiae and tarsi of plain structure, the tibiae without noticeable bristles at the tip.

"Wings brownish-yellow on the basal half, more brown apically; a large brown spot on the posterior cross-vein and another on the

arcuation of the fourth vein, before and beyond the latter vein is widely bordered with yellow. Length, including appendages, 7 mm.; of the wing, the same.

"*Female*.—Antennae much shorter, the third joint a little longer than the other two, arista apical, a little longer than in the male. Abdomen of five equal segments. Legs destitute of striking modifications, however, the spines under the fore femora are as large as in the male. Wings as in the male. Length 7.2 mm."

A male, collected at Palo Alto, California, October 11, 1905, J. M. Aldrich, collector. A male and female taken in same locality October 11, 1906, by R. W. Doane, collector.

Type.—Male; allotype female, Cat. No. 26045, U.S.N.M.

Type locality.—Salt marshes near Palo Alto, California, October 7, 1906.

Originally described from three specimens.

Also from salt marshes, San Francisco Bay, October 11, 1906, R. W. Doane, collector. Yellowstone Park Upper Geyser Basin, August 7, 1918, A. L. Melander, collector (A. L. M.). Great Salt Lake, Utah, M. C. Van Duzee, collector (C. W. J.).

2. *SCELLUS EXUSTUS* (Walker).

Plate 1, fig. 4; plate 2, figs. 12 and 18, plate 3, fig. 25.

Medeterus exustus WALKER, Insecta Saundersiana, Diptera, vol. 1. p. 211.

Scellus exustus Walker, ALDRICH, Entomological News, 1907, April, p. 135.

Scellus exustus WALKER, Neue Beitr., pt. 8, p. 71, species 1.

"*Male and female*.—Thoracis dorso aeneo-nigro opaco, abdomine supreo, later versus viridi, nitidissimo, halteribus nigris, alis nigricantibus adversus costam nigris, lamellis analibus maris albis, in basi nigris, apicem versus flavis, in summo apice puncto nigro notatis.

"The upper side of the thorax bronze-black, opaque; the abdomen copper-colored, literally green, very bright; halteres black; wings blackish, toward the fore margin entirely black; the anal appendages of the male are white, near the root black, toward the tip yellow, at the extreme tip with a black spot. Long. corp. 0.22. Long. al. 0.26. Syn. *Medeterus exustus* Walker. Dipt. Saund. 211.

"*Male*.—Black. The face rather narrow, opaque from a bright ochre-yellow dust. Antennae black. Front covered with white dust. The middle of the upper side of the thorax is, at least in my specimen, black, opaque, and exhibits some traces of gray dust; toward the lateral margin it is more bright and shows a less distinct coppery reflection; on the lateral margin itself there is a broad longitudinal stripe covered with white dust. Scutellum with two bristles, opaque upon the middle, with a thin, almost imperceptible coat of

white dust, bright on the sides. Pleurae bronze-black, on the upper half with a dusky copper-colored reflection, on the lower half with a thin gray-whitish dust. Abdomen brilliant coppery-red, in a certain light it appears brass-colored upon the posterior segments, in an oblique direction even green; its first segment almost reddish-violet. The upper appendages, peculiar to the males of *Scellus*, are of a very considerable length, white, near the root black, somewhat enlarged at the tip, curved toward each other and of a yellow color, at the extreme tip black and provided with a tuft of pale hairs, which are turned backward. Coxae black, with a thin white-grayish dust, the foremost with extremely short pale hairs, with a few stiff black little hairs and near the tip with a few black bristles. Feet black, the femora more metallic green-black, with coppery reflections; the fore femora short, but very much thickened, toward the basis on the whole underside beset with bristles of different length, on the anterior side with a row of stiff black bristles; middle femora elongated, thin, gently curved, on the underside almost entirely bare; the hind femora near the basis of the underside are enlarged into a large, blunt appendage, beset with large black spines, beyond this appendage there is an archlike excision; then again they are stouter and beset on the underside with black bristles. The fore tibiae, which are comparatively stout, bear on the front side, not far from basis, a stout black thorn, their tip is elongated into a coarse tooth and their underside, which is beset with black bristles, has somewhat before this tooth a small excision; middle tibiae long and rather slender; their first half has only three short bristles; the second is fringed on the front with a row of short black bristles; upon the posterior side somewhat beyond the middle, there are a few long black bristles, and between these and the tip of the tibia, some long, curly black hairs. The hind tibiae are much stronger than the middle tibiae, their first half is stouter than the second and the front side before the tip is armed with a strong black bristle. Tarsi plain, their joints of decreasing length, the first joint of the middle tarsi with a few bristles. Halteres brownish-black. Wings blackish, all their veins broadly margined with black; the margins of the costa and of the first four longitudinal veins are entirely confluent, so that the anterior part of the wings appears altogether black; upon the middle of the posterior transverse vein and upon the curve of the last segment of the fourth longitudinal vein there is a black spot; the costal cell is of a dark brown color.

Female.—The only female which I possess is not as well preserved as the described male, especially the characters of the face can not be recognized with certainty; I would therefore recall the

circumstance that the face of most of the females of *Scellus* is less yellow than in the males. The first joint of the antenna in the female is considerably shorter than that of the male. Fore femora and fore tibiae less stout, though the tip of the latter has also a denticiform but less stout elongation; their under side has no excision before this tooth and the front side of the tibiae no thorn. Middle femora not curved, on the larger half of their under side with a few sparse bristles. Middle tibiae plain, upon the first half with a considerable number of black bristles, upon the latter part of the posterior side without the curly hairs which are found in the males. Hind femora plain, slender toward the tip, but very little stronger upon the second part of the underside with about six rather strong black bristles. Hind tibiae without the strong bristle which, in the males, exists at the tip of the front side."

Habitat.—Middle States. (Osten Sacken); Illinois. (Le Baron.)

Type locality.—Bolton. North America.

Distribution.—Moscow, Idaho, June 14–18, 1895, June 19, 1900, and July 27–28, 1910. Brookings, South Dakota, I. H. Orcutt, collector. Hunter's Creek, Wyoming, September 11, 1895. Tennessee Pass, Colorado, July 24, 1917, J. M. Aldrich, collector. Ipswich, Mass., June 19, 1870, F. G. Sanborn, collector. Ottawa, Canada, no date (collection of C. V. Riley). Chicago, Illinois, July 5, 1895, June 9, 1899. Pullman, Washington, May 29, 1910, June 28, 1908, W. M. Mann, collector. McHenry, Illinois, June, 1900. Moscow Mountain, Idaho, July 8, 1916 (A. L. M.). Buffalo, N. Y., M. C. Van Duzee, collector. Chambly County, Quebec, Changnon, collector (C. W. J.). Orono, Maine. Hampton, N. H. Shoreham, Vt (B. S. N. H.).

3. *SCELLUS SPINIMANUS* (Zetterstedt).

Plate 1, fig. 1; plate 2, fig. 9; plate 3, fig. 24

Hydrophorus notatus ZETTERSTEDT (not Fabricius), *Insecta Lapponica*, p. 701, No. 4.

Hydrophorus spinimanus ZETTERSTEDT, *Diptera Scandinaviae*, vol. 2, p. 445, No. 5.

Scellus spinimanus Zetterstedt, LOEW, *Monograph of North American Diptera*, vol. 2, p. 204, No. 2.

Scellus spinimanus Zetterstedt, ALDRICH, *Entomological News*, vol. 18, April, 1907, pp. 185–186.

"*Male and female*.—Thoracis dorso obscure aeneo, albido-pollinose, opaco, abdomine ex viridi cupreo, nitido, halteribus subfuscis, alis nigris, basi et costae dimidia limbo subalbidis, margine postico toto cinereo, lamellis analibus maris albis, basim versus infra nigro-marginatis, apicem versus flavis, in summo apice puncto fusco notatis.

"The upper side of the thorax dusky bronze-colored, with whitish dust; abdomen coppery-green, bright; halteres brownish; wings

black, though the root and the margin of half the costa is whitish, the whole posterior margin gray; anal appendages of the male white, toward the basis on the under side with a black margin, toward the tip yellow, at the extreme tip marked with a brown spot. Long. corp. 0.15. Long. al. 0.19.

"*Male*.—Blackish bronze-colored. The face is comparatively a little broader than in *S. exustus*, covered with bright ocher-yellow dust and opaque. Antennae black. Front with whitish dust. The ground color of the thorax is of a coppery-bronze; upon the middle of the upper side more of a blackish-bronze, but almost everywhere so thickly covered with dust that the coppery luster is only very little perceptible; the dust on the upper side of the thorax is snow-white, upon the two longitudinal stripes near the lateral margin it is less thick, so that the coppery reflection of the ground-color is more distinct; upon the middle there are two narrow, dark longitudinal lines, close to each other, which do not reach as far as the posterior margin of the thorax. Upon the pleurae the color of the dust is more yellowish. The scutellum has two bristles, is rather opaque, with a thin whitish dust. Abdomen green, mostly with a coppery luster, which becomes much more bright near the lateral margin. The anal appendages are of middling length, white, near the basis of the lower margin with a narrow black border, and on the upper margin usually marked with a black spot; beyond the middle they are inflected upward and gradually assume a yellow color; their extreme tip is marked with a small brown spot and bears a small tuft of delicate pale hairs, which are turned backward; about the middle of the interior margin there is a similar pubescence; between them, toward the anal region, there is a small tuft of delicate whitish hairs. Coxae bronze-black; the four anterior with yellow and the two hind ones with a rather whitish dust; the fore coxae with very short and delicate pale hairs, near and upon the tip with a few black bristles. Feet black, femora and tibiae more black-green, the former bright coppery. Fore femora short, toward the basis very much thickened, beset on the under side with bristles of different length, on the front side with a row of stiff black bristles. Middle femora long, stronger than in *S. exustus* and more curved, on the latter half of the under side with erect black bristles. Hind femora of a plain structure, not stouter than the middle femora; their under side has only, close before the tip, a few black bristles. The comparatively stout fore tibiae have on their front side, not far from their basis, a stout black thorn; their tip is elongated into a very stout tooth, before which the under side of the tibiae, which is beset with strong bristles, has a small excision. Middle tibiae not quite so long and slender as those of *S. exustus*, on the upper side only with three or four short bristles, on the under side with a row of extremely long, straight, erect

black bristles, and on the hind side with long curved hairs, which latter are more dense near the tip and curl up to the shape of a lock of hair. Hind tibiae plain, scarcely stouter than the middle tibiae; on the upper side, not far from the basis, there is a strong bristle, and on the latter half a few small bristles; the under side is beset with short small bristles, which are isolated upon the first part and closer together and in more regular order upon the second half; at the end of the under side there is a considerable number of less strong and less short bristles, of which the last is distinguished by its greater length; on the outside of the tip of the tibiae there are several short and one longer and curved bristle, which has almost the thickness of a thorn. Tarsi plain, the joints of decreasing length, the first joint of the fore and of the middle tarsi with more, that of the hind tarsi with less bristles. Halteres yellowish-brown, the lower part of the knob more dark. The wings of uniform breadth and at the end more rounded than in the other species; an uncommonly large black spot covers their apical half with the exception of a broad gray border on the posterior margin, and extends as a broad cloud along the fifth longitudinal vein almost as far as the anal cell; inside of the discoidal cell it is somewhat paler, otherwise, however, so dark that the two black spots, peculiar to this genus, upon the posterior transverse vein and upon the last segment of the fourth longitudinal vein, can only be perceived when the wing is held toward the light; the anterior part of the wing from the basis as far as the middle is dingy-whitish hyaline; the anal angle and a broad border along the posterior margin are more hyaline-gray."

Habitat.—Fort Resolution, Hudson Bay Territory (Kennicott).

"*Female*.—It is distinguished from the male by the following characters: Face with pale yellow-grayish, front with brown dust. The middle of the upper side of the thorax with yellow-brownish dust, marked with a few spots of whitish dust. Its lateral stripes are covered with brown, the edge of the lateral margin, however, again with gray-whitish dust. The abdomen is more green, less coppery and less bright than in the male. The dust upon the pleurae and upon the fore coxae is less yellow. The fore femora are of a similar structure as those of the male; the fore tibiae without a thorn on the inside, elongated at the tip in a much smaller and sharper tooth, before which there is no excision; otherwise the feet are plain, the middle and hind femora straight and much more slender than in the male; middle and hind tibiae only sparsely beset with scattered bristles.

"*Observation*.—As I do not possess a North American female of *S. spinipes*, I have prepared the above description from Swedish specimens."

Type locality.—Lapland. Also from Hudson Bay Territory.

4. SCÉLLUS MONSTROSUS Osten Sacken.

Plate 1, fig. 6; plate 2, figs. 13 and 20; plate 3, figs. 26 and 27.

Scellus monstrosus OSTEN SACKEN, Western Diptera, 1877, p. 319.

"*Male*.—Thorax brownish-gray, with several rows of brown dots on which the bristles are inserted, and two approximate brown lines; wings tinged with brownish; anal appendages of the male at least as long as the abdomen, white; their end brownish-yellow, inverted spoon-shaped. Length 6–7 mm. (without the appendages).

"Face brownish-ocher-yellow; antennae black; front dull greenish gray; inferior orbit beset with yellow hair; the superior with stiff, black spines. Ground color of the thorax concealed under a thick grayish-brown pollen; three rows of brown dots, in linear groups of three or four, bear the usual dorsal bristles; on each side of the intermediate row there is an uninterrupted brown line reaching to the scutellum; the coppery ground color of the thorax is visible on the dorsum above the wings; a large, coppery, shining spot on the upper part of the pleurae; a smaller one at the foot of the halteres; abdomen copper-colored; halteres yellow, the extreme root brownish; tegulae with yellow cilia. Anal appendages at least as long as the abdomen, ribbonlike, white, except at the root, which is brown; they are angularly bent in the middle, the latter half expanded, inverted spoon-shaped yellowish-brown, bearing a fan-shaped tuft of long hairs at the end. Legs metallic-coppery; tarsi black. Lobe at the end of the front tibiae very large, deeply emarginate at the base; the long spine on the inner side of the tibiae appears bifid, from a strong bristle near its tip; middle tibiae, besides some stiff bristles on the upper and under side, with a fringe of soft hairs on the hind side, which become longer toward the tip, and end there in a tuft of curly hair; the hind tibiae end in a very long curved spine, hook-shaped at the tip (if stretched out, it would be nearly as long as one-third of the first joint of the hind tarsi); a smaller spine near it. Wings yellowish at the root, otherwise tinged with brown, especially between the first and third veins; costal cell tinged with yellowish; a brown cloud on the great cross-vein; another on the curvature of the fourth vein; some subhyaline spots near the root of the wings, the most conspicuous of which is on the proximal end of the third posterior cell."

Habitat.—British Columbia (Crotch). A single male.

Type locality.—British Columbia (Crotch).

Distribution.—Tennessee Pass, Colorado, July 24, 1917, J. M. Aldrich, collector. Burns, Oregon, B. G. Thompson, collector. Lake View, Montana, August 3, 1920, A. N. Caudell, collector. Yellowstone Park, Canyon Camp, August 12, 1918, A. L. Melander, collector (A. L. M.).

5. *SCELLUS VIGIL* Osten Sacken.

Plate 1, fig. 2; plate 2, figs. 10 and 23; plate 3, fig. 30.

Scellus vigil OSTEN SACKEN, Western Diptera, 1877, p. 318.

"*Male*.—Thorax grayish above, with two approximate brown lines; abdomen and pleurae copper-colored, partly metallic-greenish; wings subhyaline, with a double grayish spot on the great cross-vein, and a similar larger spot on the last section of the fourth vein; anal appendages of the male narrow, white, blackish at the base. Length 3.5–4.5 mm.

"Face brownish-yellow, narrow above, broader below; antennae black; the ground-color of the front is concealed under a grayish pollen. Thorax above with a dense gray pollen almost concealing the coppery ground color; two approximate brown lines in its middle stop some distance before reaching the scutellum; between their end and the scutellum, an opaque dark brown spot. Pleurae coppery, with greenish reflection, slightly pruinose. The scutellum, with two bristles, is greenish, coppery, or purplish. Abdomen (very much shrunken and withdrawn in my specimens) coppery, pruinose above, brilliant coppery, and greenish on the sides. Anal appendages ribbonlike, white, blackish near the root. Legs metallic-green or coppery, with purple reflections; tarsi black. The structure of the legs agrees in the main with the description of the legs of *S. filifer* Loew.³ Halteres whitish. Wings subhyaline, their root yellowish; costa yellowish-brown before its junction with the first vein; a double grayish spot on the great cross-vein, and a similar larger spot on the last section of the fourth vein; the latter is well defined on the proximal and evanescent on the distal side."

Habitat.—Webber Lake, Sierra Nevada, July 22–24. Three males found resting on stones on hillsides.

This species differs from *S. filifer* Loew (Fort Resolution, Hudson Bay Territory) in the coloring of the wings, which have no longitudinal gray streaks between the veins, the color of the anal appendages, which are not yellow at the end, etc. Nevertheless, the resemblance between the two species must be very great.

Type locality.—Webber Lake, Sierra Nevada.

Distribution.—Pullman, Washington, May 25, 1908. Moscow Mountain, Idaho, June 17, 1918, July 5, 1919, July 9, 1920 (A. L. M.). Moscow, Idaho, no date. Pullman, Washington, May 31, 1913.

6. *SCELLUS AMPLUS* Curran.

Plate 1, fig. 3; plate 2, figs. 11 and 21.

Scellus amplus CURRAN, Can. Ent., vol. 55, 1923, p. 73.

"Middle tibiae swollen and polished at apex, with a long spine just before the swelling beneath; front basitarsus with a long spine

³ Monograph, pt. 2, p. 210.

below before the middle and two or three smaller ones. Allied to *filiferus* Loew, but that species has numerous shorter spines on front basitarsi and dense ciliate hairs behind on the middle tibiae.

"Length, almost 5 mm., wing 6.5 mm.

"*Male*.—Face narrow, widened below, ocher-yellow; front yellow with some ocher pollen; the ground color bronze green; occiput yellow, with cupreous reflections. Palpi yellow, proboscis black. Antennae black, shining; third joint elongate oval, subpointed above, a little swollen at the origin of the arista; not shining, with short whitish hair. Basal portion rather thick; last section slender, curved about its middle.

"Thorax cupreous bronzed, rather thickly grayish pollinose, but not completely obscuring the ground color, dorsum with two narrowly separated median brownish stripes, abbreviated behind, and an obscure similarly colored stripe above the wings. Each of the few hairs arises from a black spot. Pleura much less densely pollinose. Scutellum moderately pollinose.

"Legs black, femora bronzed, tibiae more greenish. Fore femora thick basally, gradually tapering. Anterior tibiae with the sub-basal spur black, its upper surface yellow pollinose, and with pale yellowish hairs; just below the origin of the spur, on the outer side a long black spine, with a shorter one above it; apex of tibiae produced as a rather broad, blunt lobe, which is of about the same length as the last tarsal joint; the lobe behind with three or four black bristles, its anterior and apical margin with a fringe of short, black hairs; immediately above the lobe in front the tibia is fringed with yellow hairs, dense and longer apically; beneath toward the front is a row of black bristles, longer apically, behind, on the swollen subbasal fourth with much longer bristles. Front basitarsi postero-ventrally, just before the middle, with a long bristle and two or three short ones before it on posterior surface. Middle femora strongly arcuate, the apical two-thirds swollen, beneath, on the hind surface with a single row of black bristles, but these are mixed with the long, bristly hairs on the upper half, and not distinguishable; anterodorsally is a row of five or six bristles on the apical third. Middle tibiae also moderately arcuate and swollen on basal portion, the posterior surface flattened; bearing long, not very abundant hairs which appear slightly tufted, and especially marked on the swollen area; above the middle on the outer side with two bristles and a slightly stouter one just before the apex; apex swollen and polished, more extensively so on the posterior side; just above this area on the inner side a stout, apically curved bristle. Middle basitarsi on either side below with a row of long spines. Hind femora laterally compressed, bearing dorsally two subapical bristles and a posterior one just before the apical dorsal one. Hind tibiae a little

curved outward when viewed from the side; their outer surface with about four equally spaced spines, their inner, posterior apical half with nine similar spines not in a regular row; the opposite surface with more or less regular hairs. Coxae grayish-white pollinose, with fine yellow pile, the front ones with a row of black bristles.

"Wings largely clear hyaline, but beyond the middle the cells are cinereous, fading out apically; on the cross-vein is a double, fused spot occupying all either end, and a second spot on the curve of the last section of the fourth vein; there is also a streak in the discal cell, and the area behind the fifth vein from the tip of the sixth vein is darker, but fades out marginally.

"Abdomen on basal four segments and side of the fifth, coppery, the fifth and sixth bronze green; except the sixth segment, rather abundantly yellowish-gray pollinose. Fillaments black basally, becoming brown, the apical half yellow: the basal portion, which is directed to the upper margin of the abdomen and about one-fifth of the second portion, which is directed backward, is black; from there to about the second third of this portion it is yellowish brown, the last third yellow; the second portion is terminated in a broad, inferior ciliae of yellow hairs, which extend all along the yellow portion, and the third portion curves obliquely upward from this point, again curving back, but the pointed end curved a little upward; the outer upper margin of the last section, not reaching to the tip, is ciliate, with pale yellowish or white hairs, which are directed downward so as to cover the whole of this side of the filament. The terminal lamellae are fuscous, broadened and then ending in a pair of parallel processes, which are long, flattened and subpointed, each bearing four or five not long black hairs apically.

"*Holotype*—Male, Saanich, British Columbia, May 17, 1919 (W. Downes), No. 554 in the Canadian National Collection, Ottawa."

In looking over the above description I find there are some details of some of the characters which have been omitted. As I had the following description written for this new species I thought it would be of interest and important enough to give it as I had intended to publish it.

Medium-sized species bronze, gray dusted; wings tinged with yellowish-brown (more so in the female); antennae short and normal.

Dorsum of thorax opaque, ashen gray with two approximated, parallel, central, dark, dull brown stripes extending backward to the penultimate pair of bristles, from here the stripe is solid, dark bronze, metallic (the width of this stripe almost equal to the space between the two stripes); the bristles of the two central rows are each located on a brown spot; halteres yellowish white; wings more hyaline in the male, decidedly brownish in the female; the costal vein to the tip of the first vein and the entire first vein yellow, all the

other veins are blackish; male wing has a faint double spot on the posterior cross-vein and a faint spot at the bend of the apical segment of the fourth vein; female wing with the above spots much darker and a large, definite, light spot below the fifth vein in front of the basal cell; male appendage narrow with a nearly quadrate enlargement in the middle.

Length.—Male, 3.5 mm. (without appendages); female, 5 mm.

The narrow face dull ocher, broader below; front dull gray. Pleura bronze colored with a thick, opaque, gray dust; just in front of the halteres is a well-developed fingerlike tubercle. The scutellum same color as the pleurae and with two large bristles at the apex. The abdomen is dark, metallic bronze, not so thickly dusted as the thorax; broadly along the apical edge of the segments and toward the outer edges the dust is whitish. Anal appendages of the male white and ribbonlike on the apical half with a fine fringe of short white hairs on inner edge; basal portion is blackish; in the middle is a broad area which is nearly quadrate with a fringe of brownish-yellow hairs along the inner and outer edge, that on the inner edge is longer; other parts of the genitalia are brownish with yellow hairs. Coxae of a blackish bronze color with whitish dust. Feet black, the femora with a more coppery, the tibiae with a more metallic-greenish tinge. Fore femora much thicker at the base, on under side strong black bristles of various length. Middle femora thickened on apical two-thirds, bent inward and downward at the basal third. Hind femora thickened, the basal edge is straight, the upper edge is arched. Fore tibiae thickened on the apical two-thirds, near the basal third on the inner side is a thick spikelike projection, on the front inner side is a long bristle, numerous short thick spinelike bristles on the under and inner edge. Middle tibiae slightly thickened at base, two faint curves; on the under and outer side is a long tuft of curved hairs, more curly on outside; numerous bristlelike hairs on inner under side near the apex; on under side near the apex is a very thick spine bent at right angles. Hind tibiae normal with several short spinelike bristles on the apical third, at the apex are three thick bristles, one is sharply bent at apex. Tarsi all simple, black; front metatarsus with a long bristle on the under side below the middle; middle metatarsus has several heavy bristles on under side, four very long ones are arranged in a row. Wings faintly infuscated on the apical half from the fourth vein to the costa, a small cloud near the middle of the outer section of the fourth vein and a cloud on the third cross-vein. The first vein entire and the costal vein from the tip of the first vein to the base is pale yellow, all the other veins brownish-black. Halteres yellow with base of stem blackish. Tegulae and cilia pale yellow.

Type locality.—Saanich, British Columbia, May 17, 1919, W. Downes.

Distribution.—Whitehall, Montana, July 11, 1917, H. G. Dyar, collector. Forest Grove, Oreg., September 30, 1918, F. R. Cole, collector. Gold Creek, Mont., July 29, 1918. Moscow Mountain, Idaho, July 5, 1919, June 26, 1920, A. L. Melander, collector.

7. *SCELLUS FILIFERUS* Loew.

Plate 1, fig. 5; plate 2, figs. 14 and 17; plate 3, fig. 29.

Scellus filiferus LOEW, Monographs of North American Diptera, 1864, pt. 2, p. 209.

Male.—"Thoracis dorso cinereo, opaco, abdomine cupreo, cinereo-pollinose, subopaco, halteribus albidis, alis hyalinis in basi subalbidis, apicem versus cinereo-striatis punctisque duobus majusculis nigricantibus, altero didymo in vena transversa posteriore, altero simplici in ultimo venae longitudinalis quartae segmento; lamellis analibus maris angustissimis albis, in basi nigris, in summo apice flavicantibus.

"Upper side of the thorax gray, opaque; abdomen copper-colored with grayish dust, rather opaque; halteres whitish; wings hyaline, whitish near the root with gray stripes toward the tip; upon the posterior transverse vein with a double blackish spot of considerable size, and with a similar, but single spot upon the last segment of the fourth longitudinal vein; the anal appendages of the male are very narrow, white, black at the basis and yellowish at the extreme tip. Long. corp. 0.15. Long. al. 0.20.

"The narrow face is ocher-yellow. Antennae black. Front with white dust. Thorax blackish-bronze colored with copper-colored reflections; on the upper side with thick whitish dust, which almost conceals the ground color, opaque; upon the pleurae with a somewhat thinner dust of the same color. Upon the middle of the upper side there are two narrow parallel lines of a darker color, which do not reach as far as the posterior margin of the thorax. The scutellum, which has two bristles, is of the same color as the pleurae. The ground color of the abdomen is like that of the thorax, is, however, more distinct, not being so thickly covered with dust; toward the lateral margin of the abdomen, where the dust almost entirely disappears, there is a bright copper-colored luster. The anal appendages of the male, which are turned upward at the tip, are not ribbonlike, as in the previously described three species, but filiform, white, black at the root, at the tip pale yellowish to a small extent; on the middle of their exterior margin there is a dense beard of delicate little white hairs; there is no tuft of hairs at their tip. Between them, in the anal region, only a moderate number of short delicate little hairs, which may be easily overlooked, are inserted. Coxae of a blackish-

bronze color with whitish dust; the fore coxae have, besides the pale, and, on account of its shortness and delicacy, almost imperceptible pubescence, quite a number of black bristles. Feet black, the femora with a more coppery, the tibiae with a more metallic-greenish, tinge. Fore femora rather strongly thickened toward the basis, on the under side with strong black bristles of different length, on the front side only with an imperfect row of short black bristles. Middle femora moderately thickened and strongly curved, on the under side of the basis with two or three not very long, on the apical half with a large number of long, straight and erect bristlelike black hairs. Hind femora plain, of middling stoutness, on the under side with bristlelike short hairs; on the upper side with two longer black bristles, of which the larger is not far from its tip. Fore tibiae strong, with a large and sharp thorn on the front side, not far from the basis; elongated at the tip into a large clumsy tooth; the under side of the tibia, provided with bristles, has no distinct excision before this tooth. Middle tibiae long, straight, a little stronger in the neighborhood of the basis; the first two-thirds of their under and posterior side are fringed with long curly black hairs, the end of the under and front side, however, with long and stiff black bristles; on the under side, where these bristles begin, there is between them a somewhat curved black thorn. Hind tibiae straight, on the under side with short but very strong black bristles, one of which, being not far from the tip, is remarkable for its greater length; on the outside of the tip of the tibiae a few shorter and one somewhat longer curved bristle are inserted. Tarsi plain, their joints of decreasing length; the first joint of the fore and middle tarsi on the under side with black bristles, which are of considerable length near the basis of the tarsi, but decrease in length very rapidly so as to be very short on the larger portion of the joint; the under side of the first joint of the hind tarsi is everywhere beset with short black bristles. Halteres pale-yellowish, but the basis of the knob somewhat brownish. Wings hyaline; almost the whole basal third appears somewhat whitish when seen in a certain direction; grayish stripes along the second half of the second and third longitudinal veins, likewise along the tip of the last segment of the fourth and the greater portion of the fifth longitudinal vein; there is also a gray streak between the third and fourth longitudinal veins; upon the posterior transverse vein there is a blackish-gray double spot, and upon the middle of the last segment of the fourth longitudinal vein there is a larger rounded blackish-gray spot, which is less sharply defined on the side turned toward the tip of the wing."

Habitat.—Fort Resolution, Hudson Bay Territory (Kennicott).

Type locality.—Fort Resolution, Hudson Bay Territory (Kennicott).

Distribution.—Tennessee Pass, Colorado, July 8. Fairbanks, Alaska, June 30 to July 4, 1921, J. M. Aldrich, collector. Moscow, Idaho, no date. Custer, South Dakota, no date. Tabernash, Colorado, August, E. S. Tucker, collector. Mountains near Sheridan, Wyoming. Mount Constitution, Washington (Orcas Island) July 7, 1905. Bozeman, Montana, 4,800 feet, June 21, 1900, R. E. Cooley, collector. Bozeman, Montana, 4,800 feet, July 8, 1901, E. J. S. Moore, collector; Moscow Mountain, Idaho, July 8, 1911. Yellowstone Lake, Montana, August 8, 1918. Moscow Mountain, Idaho, July 5, 1919, A. L. Melander, collector (A. L. M.). Farewell Creek Saskatchewan (C. W. J.).

8. *SCELLUS AVIDUS* Loew.

Plate 1, fig. 7; plate 2, figs. 16 and 22.

Scellus avidus LOEW, Monographs of North American Diptera, 1864, pt. 2, p. 207.

Male.—"Thoracis dorso aeneo-nigro, nitido, margine et linea, media cinereo-pollinosis, pleurarum plaga supera, abdomineque ex viridi laete cupreis, nitidissimis, halteribus albis, alis cinereis, punctis duobus nigris, altero in vena transversa posteriore, altero in ultimo venae longitudinalis quartae segmento; lamellis analibus maris albis, basi et apice tamen nigris.

"Upper side of the thorax bronze-black, shining, its margin and a middle line dusted with gray powder; a large spot on the upper part of the pleurae and the abdomen bright greenish-copper colored, very shining; halteres white; wings gray with two large dots, one on the posterior transverse vein, the other upon the last segment of the fourth longitudinal vein; the anal appendages of the male are white, but their basis and tip are black. Long. corp. 0.17. Long. al. 0.21.

"*Male*.—Face somewhat broader than in the previous two species, dusted with bright ocher-yellow powder, opaque. Front with white dust. Antennae black. Most of the upper side of the thorax bright bronze-black with faint violet reflections; its whole margin has a rather broad border dusted with a whitish-gray powder, and therefore opaque; there is also a narrow middle line, which is much abbreviated behind and likewise dusted with a white-grayish powder. The upper part of the pleurae, from the shoulder to the root of the wings, is entirely without dust, metallic greenish-copper colored, very much shining; as I have only a single specimen, I am unable to judge with certainty whether this large shining spot is also present in fresh specimens, as I believe it to be, or whether in the above-described specimen it is merely rubbed off; the other parts of the pleurae are dusted with gray. The scutellum, which has two bristles, is greenish-bronze colored and opaque. The very shining abdomen is of a bright coppery color, but assumes, when its surface

is looked upon in a very oblique direction, a green or at least brassy-yellow color. The tapelike anal appendages are very long, somewhat blackened at the basis, and still more so at the tip which is turned upward and there beset with a small tuft of blackish hair directed backward; otherwise their margins are not hairy, although there is a single black bristle where the blackening of the tip begins on the under side in the vicinity of its inner margin. Near the anus between the above-mentioned two appendages there are a few small black hairs. Coxae greenish-black, with white-yellowish dust; the foremost have, besides some pale hairs, almost imperceptible on account of their shortness and delicacy, a few black bristles before and upon the tip. Feet black with a metallic-green reflection, which gradually disappears upon the last joints of the tarsi. Fore femora toward their root not so much thickened as in the two preceding species, beset with strong black bristles of different lengths on the under side, on the front side with a sparse row of short black bristles. Middle and hind femora long, slender, straight, of a plain structure, beset on the second half with a moderate number of short, scattered black bristles. The moderately stout fore tibiae bear on their anterior side, not far from the basis, a short black thorn and are prolonged at their tip into a large, somewhat clumsy but sharp tooth, before which the under side of the tibia, provided with bristles, has a very small excision. The middle tibiae are long and slender; on the upper side they are beset with only three, on the anterior side with about seven scattered bristles of very moderate length; on the other half of their hind side they bear long curly black hairs. Hind tibiae slender, straight, rather long, only on the second half with a few isolated black bristles; the bristles on the outside of their tips are also only short. Tarsi plain, their joints of decreasing length; the first joint of the fore and middle tarsi on the under side with numerous black bristles, the first joint of the hind tarsi only with a few and much shorter bristles. Wings hyaline-gray, somewhat darker toward the tip on account of the gray margin of the second, third, and fourth longitudinal veins; upon the posterior transverse vein and upon the middle of the last segment of the fourth longitudinal vein there is a gray-blackish spot of considerable size."

Habitat.—Fort Resolution, Hudson Bay Territory (Kennicott).

Type locality.—Fort Resolution, Hudson Bay Territory (Kennicott).

Distribution.—Hunter's Creek, Wyoming, September 11, 1895. Tennessee Pass, Colorado, July 24, 1917, J. M. Aldrich, collector. Colo. 2009 U.S.N.M. Cumbers, New Mexico, August 14, 1901, 10,000 feet altitude, Dyar and Caudell, collectors. Hunter's Creek, Wyoming, September 11, 1895, Colo. 2009 (A. L. M.). High River, Alberta, Owen Bryant, collector (C. W. J.).

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EXPLANATION OF PLATES.

All drawings made by C. T. Greene.

PLATE 1.

- Fig. 1. *Scellus spinimanus* (Zetterstedt). Abdomen of male.
 2. *Scellus vigil* Osten Sacken. Abdomen of male.
 3. *Scellus amplus* Curran. Abdomen of male.
 4. *Scellus exustus* (Walker). Abdomen of male.
 5. *Scellus filiferus* Loew. Abdomen of male.
 6. *Scellus monstrosus* Osten Sacken. Abdomen of male.
 7. *Scellus avidus* Loew. Abdomen of male.
 8. *Scellus virago* Aldrich. Abdomen of male.

PLATE 2.

- Fig. 9. *Scellus spinimanus* (Zetterstedt). Front leg of male.
 10. *Scellus vigil* Osten Sacken. Front leg of male.
 11. *Scellus amplus* Curran. Front leg of male.
 12. *Scellus exustus* (Walker). Front leg of male.
 13. *Scellus monstrosus* Osten Sacken. Front leg of male.
 14. *Scellus filiferus* Loew. Front leg of male.
 15. *Scellus virago* Aldrich. Front leg of male.
 16. *Scellus avidus* Loew. Front leg of male.
 17. *Scellus filiferus* Loew. Front leg of female.
 18. *Scellus exustus* (Walker). Front leg of female.
 19. *Scellus virago* Aldrich. Front leg of female.
 20. *Scellus monstrosus* Osten Sacken. Front leg of female.
 21. *Scellus amplus* Curran. Front leg of female.
 22. *Scellus avidus* Loew. Front leg of female.
 23. *Scellus vigil* Osten Sacken. Front leg of female.

PLATE 3.

- Fig. 24. *Scellus spinimanus* (Zetterstedt). Middle leg of male.
 25. *Scellus exustus* (Walker). Hind leg of male.
 26. *Scellus monstrosus* Osten Sacken. Middle leg of male.
 27. *Scellus monstrosus* Osten Sacken. Hind leg of male.
 28. *Scellus virago* Aldrich. Middle tibia of male.
 29. *Scellus filiferus* Loew. Middle leg of male.
 30. *Scellus vigil* Osten Sacken. Middle leg of male.



1

spinimanus Zetterstedt



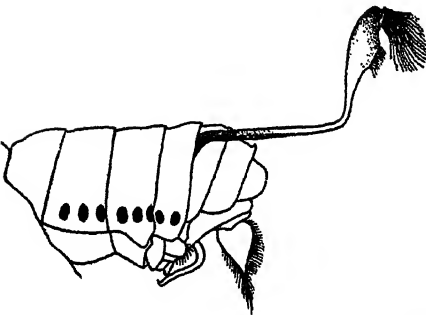
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vigil Osten Sacken



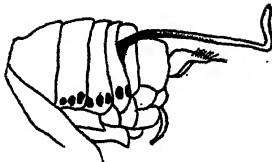
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amplius Curran



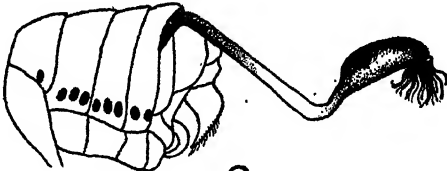
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exustus Walker



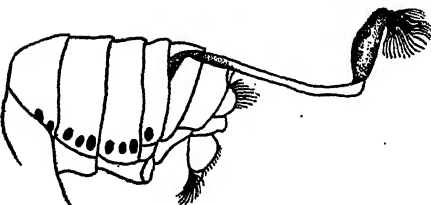
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filiferus Loew



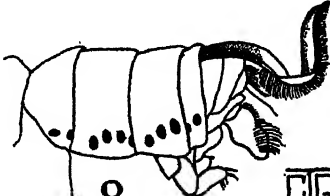
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monstrosus Osten Sacken



7

avidus Loew



8

virago Aldrich

CG



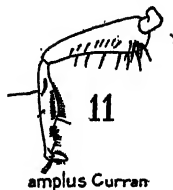
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spinimanus Zetterstedt



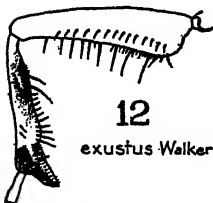
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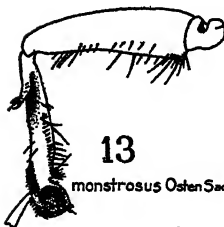
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amplus Curran



12

exustus Walker



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monstrosus Osten Sacken



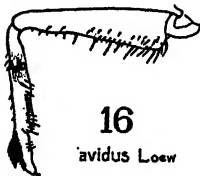
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filiferus Loew



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virago Aldrich



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avidus Loew



17

filiferus Loew



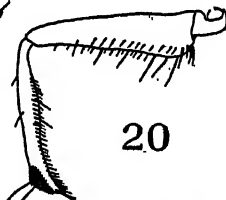
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exustus Walker



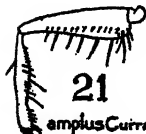
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virago Aldrich



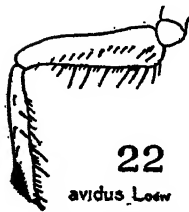
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monstrosus Osten Sacken



21

amplus Curran



22

avidus Loew

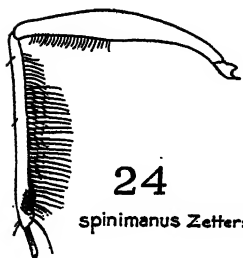


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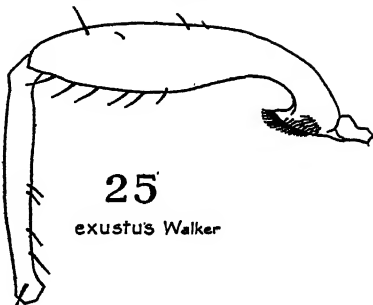
NORTH AMERICAN SCELLUS

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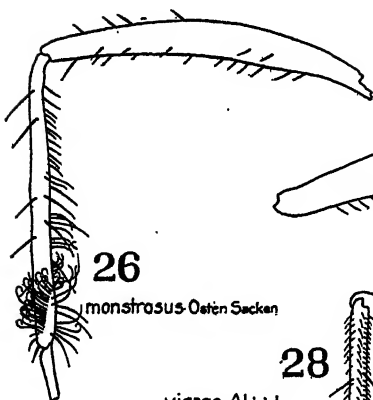
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spinimanus Zetterstedt



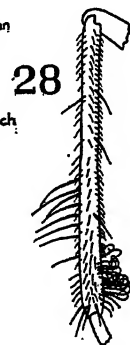
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exustus Walker



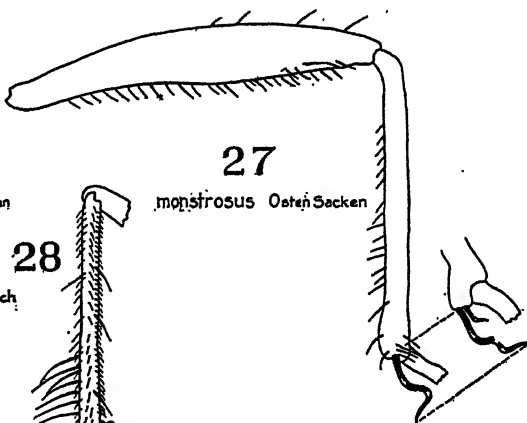
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monstrus Osten Sacken



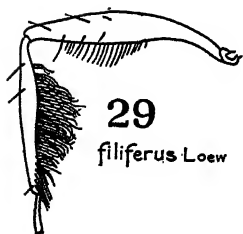
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virago Aldrich



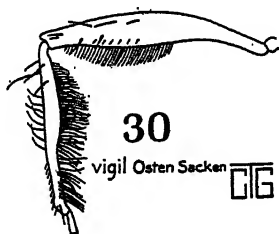
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monstrus Osten Sacken



29

filiferus Loew



30

vigil Osten Sacken

CG

NORTH AMERICAN SCELLUS

FOR EXPLANATION OF PLATE SEE PAGE 18

STUDIES ON THE MORPHOLOGY, TAXONOMY, AND ECOLOGY OF THE LARVAE OF HOLARCTIC TIGER-BEETLES (FAMILY CICINDELIDAE).

BY CLYDE C. HAMILTON,

Associate Entomologist, University of Maryland.

INTRODUCTION.

Larvae of the Cicindelidae were first noted in literature as early as 1798. The first work of importance is that of J. C. Schiodte: *De Metamorphosi Eleutheratorum observationes, Carabi*. in 1867. His observations, descriptions, and figures of *Cicindela hybrida* and *C. campestris* are excellent. George H. Horn, in 1878, gave a detailed description of a larva from each of the four genera occurring in the United States. His descriptions are too general to be of much morphological or taxonomical value. During the same year and several succeeding years F. G. Schaupp published a number of notes on tiger-beetle larvae.

From this time until 1905 very little attention was given to the study of the larvae. In 1907 Dr. V. E. Shelford published in the *Biological Bulletin* an excellent account of the habits and distribution of a number of the species occurring in the vicinity of Chicago, Illinois. The following year he published on the life history and habits of these same species and considered their relation to hibernation, depth of burrow, moisture, temperature, etc. In later papers he has made detailed comparisons of the ecology of the larvae of the same species and of different species from widely separated regions.

During 1907 and 1910 Norman Criddle published in the *Canadian Entomologist* excellent accounts of the habits and life histories of a number of the species occurring in Manitoba, Canada. Some of the more interesting facts he pointed out are the increased depth of the burrow, the smaller size of the species and the lengthening of the life history, due to the long severe winters and short summers.

An interesting paper on the habits of *Amblychila cylindriciformis* was published in the *Entomological News* for 1914 by F. X. Williams and H. B. Hungerford. The most comprehensive work on all stages of the Cicindelidae, however, is that of Walter Horn, published in the *Genera Insectorum*. He discusses practically every

phase of the subject, as classification, morphology, life history, ecology, coloration, etc., and includes a complete bibliography under each species.

The present paper is a revision and an addition to work done in 1916 at the University of Illinois for a Masters Thesis. As presented at that time it consisted solely of the part on the classification of the larvae. The work was done under the direction of Prof. A. D. MacGillivray who gave many helpful suggestions and criticisms.

A study of the larvae was made possible through the opportunity for the purchase of a collection of determined material from Dr. V. E. Shelford and, unless otherwise stated, the larvae were collected and reared by him. He also permitted me to use his unpublished notes and gave numerous suggestions on the habits of the larvae. I am indebted to Prof. S. A. Forbes and the Graduate School of the University of Illinois for securing this collection.

The scope of the paper was considerably extended through the opportunity to study a collection of larvae of the genus *Omus*, together with some additional larvae of the genus *Cicindela*, sent to Prof. A. D. MacGillivray by Dr. F. E. Blaisdell, sr., of the Leland Stanford Junior University Medical School. Larvae of *Amblychila cylindriciformis* were secured through the courtesy of Prof. S. J. Hunter, of the Department of Entomology, University of Kansas.

From 1916 until 1922 little was done on the paper except the occasional collection of larvae. It was then decided to include the morphology of the larvae and add to the classification a number of additional species in the collection of the United States National Museum. Thanks are due Dr. L. O. Howard, Honorary Curator, Division of Insects, for permission to study this material and to Dr. Adam Böving, of the Bureau of Entomology, for assistance on the morphology. The entire larval material in the museum has been studied and revised; 17 undetermined or wrongly determined species have been named. Three species not represented in the collection have been given to the United States National Museum by the author. Acknowledgments are expressed to the Agricultural Experiment Station of the University of Maryland for the time used in revising this paper.

All drawings have been made by the author. Charles Leng's Catalogue of the Coleoptera of America North of Mexico, 1920 edition, has been followed in the nomenclature.

MORPHOLOGY OF THE LARVA.

The larvae of the Cicindelidae (figs. 1 to 4) are long, cylindrical, and grub-like and normally live in burrows in the soil. Some of

the tropical species are arboreal and the larvae live in burrows in the smaller twigs. The habits of the larvae have resulted in several morphological adaptations. The head and pronotum are strongly chitinized and highly colored on the dorsal part, the mesothorax and metathorax are much less chitinized and the abdomen is membranous with chitinized, setaceous areas. The head and prothorax are bent ventrad at an angle of about 45 degrees, the fifth abdominal segment has a prominent projection on the dorsal aspect, and the segments caudad of the fifth are curved ventrad. The mature larvae vary from three-fourths to about two inches in length.

In describing the morphology of the larvae one species has been taken as the type and only a few of the more characteristic variations in other species and genera have been considered. *Cicindela limbalis* has been chosen for this purpose since it is one of the larger and more generalized species of the *Cicindela* and is widely distributed.

HEAD.

The head will be discussed under two divisions—the fixed parts or the head capsule and the movable parts or the appendages.

Head capsule.—The head capsule (figs. 5, 6, and 8) is heavily chitinized, slightly concave on the dorsal aspect and strongly convex on the ventral. The dorsal surface is bronze, with a bluish-green luster, the ventral surface a light chestnut brown. The head capsule is divided into two areas—the epicranium and the fronto-clypeolabral area—by the epicranial and frontal sutures. The epicranium is divided into two halves—dorsally by the epicranial suture, ventrally by the gular suture. The *epicranial suture* (*eps*, fig. 8) is on the dorso-meson and extends cephalad a short distance from the occipital foramen. From this point a *frontal suture* (*fs*, fig. 8) (=arms of epicranial suture) extends cephalo-laterad as a sinuate line to each antennal fossa. The *gular suture* (*gus*, fig. 14) is on the ventro-meson and extends cephalad from the occiput to the attachment of the labium.

The *occiput* (*oc*, figs. 5 and 8) is the narrow, slightly raised, band-like sclerite extending around the caudal margin of the head capsule. It is separated from the epicranium by the *occipital suture* (*ocs*, fig. 8) and is strongly infolded on the ental surface.

The *epicranium* consists of the following not distinctly defined regions: Vertex, genae, and postgenae. The *vertex* (*ve*, figs. 5 and 8) occupies the dorsal and lateral parts of the epicranium and extends from the occiput to the frontal suture and the insertion of the mandible. It includes within its boundaries the location of the antennae and the ocelli. A prominent ridge extends cephalo-mesad from each caudal ocellus to the frontal suture. The part of the head

caudad of this ridge, named *collum* (*co*, fig. 8) is strongly deflexed. The *genae* (*ge*, figs. 5 and 14) include the greater part of the epicranium on the ventral aspect of the head. They extend from the occiput cephalad to the postgenae, laterad and dorsad to the vertex, and meet on the meson. The *postgenae* (*pge*, figs. 5 and 14) include the ventral and lateral part of the epicranium cephalad of the genae. They extend from the genae to the cephalic margin of the head capsule, laterad to just beyond the ventral articulation of the mandible, and mesad to the hypostoma and the attachment of the cardo. The cephalic margin is inflexed and produced as a triangular projection between the mandible and maxilla, where it joins with the ventral part of the clypeus.

The *hypostoma* (*h*, fig. 14) is a paired structure and consists of a V-shaped area mesad of the postgenae on the ventral aspect of the head. Its caudal extent is indicated by a short, dark, transverse bar, which is about one-third the distance to the caudal margin of the head. This transverse bar is the point of attachment of the caudal arms of the tentorium. The maxillae and labium are attached at the cephalic margin of the hypostoma.

The *fronto-clypeo-labral area* (*fcla*, fig. 8) is between the frontal sutures and extends cephalad to the cephalic margin of the head. It consists of the frons, clypeus, and labrum. The sutures separating these sclerites are obsolete. The *frons* (*f*, fig. 8) is between the frontal sutures and is considered as extending cephalad to the cephalic margin of the small sclerite, the "latero-clypeus," mesad of the antennae. Its cephalic margin is determined by the point of attachment of the anterior arms of the tentorium. There is a *U-shaped ridge* (*us*, fig. 8), bearing two setae, on the caudal part of the frons. The *clypeus* (*c*, fig. 8) is considered as extending cephalad from the frons to just cephalad of the tooth-like projection on the cephalo-lateral angles. Each lateral one-fourth of the clypeus, named "*angulus frontalis*" by Schiödt, is raised above the mesal part (*af*, fig. 8). The ventral surface of the clypeus is strongly joined to the postgenae ventrad of each tooth-like projection. The *labrum*, forming together with the cephalic part of the clypeus the "*nasale*" (Böving), is folded back on its ventral aspect to the epipharynx (figs. 7 and 8). The small, rectangular sclerite (*lc*, fig. 8) mesad of the antenna is considered as a lateral sclerite of the clypeus. For this sclerite I propose the name of "*latero-clypeus*."

The *tentorium* or internal head skeleton, consisting of the anterior, dorsal, and ventral arms, is not strongly developed. Each *anterior arm* (*aant*, fig. 7) is attached along the suture separating the latero-clypeus from the clypeus and, at its cephalic end, is produced into a knob-like projection to which the dorsal acetabulum of the mandible articulates. Each anterior arm projects ventro-mesad until they

meet and fuse with the ventral arms of the tentorium. The *dorsal arms* (*dat*, fig. 7) of the tentorium are fused with the anterior arms and, on the inner surface of the head, are attached along the caudal part of the suture separating the latero-clypeus from the clypeus. From the middle of each fused arm a free part projects dorso-caudad. These, however, do not represent the dorsal arms since they do not connect with the head capsule. The usual place in adult insects for the attachment of the anterior arms of the tentorium is at the lateral ends of the fronto-clypeal suture; and for the dorsal arms of the tentorium at some point near the antennal sockets. To a large extent this same relation holds true in immature stages. In the larvæ of the Cicindelidae the antennae are inserted so near the cephalic margin of the frons that it leaves only a short distance between the points of invagination of the anterior and the dorsal arms of the tentorium and, as a result, the two have fused. The *ventral arms* (*vat*, fig. 6) of the tentorium have also fused through the mesal fusion of the epicranium. The invagination for the ventral arms of the tentorium is on the meson at the caudal margin of the hypostoma. It extends entad a short distance, as a strongly chitinized structure, and connects with the anterior and dorsal arms. A thin plate-like projection (fig. 6) extends caudad along the meson from the invagination for the ventral arms and, at the caudo-ventral part of the head, is produced cephalad as a broad lamella-like structure.

The *ocelli*, consisting of six pair, are on the vertex on the dorsal and lateral aspects of the head. The diameter, distance apart and comparative size of the two larger ocelli furnish excellent taxonomic characters. To facilitate referring to the ocelli they have been numbered, starting with the largest and numbering to the smallest. *Ocellus 1* (01, fig. 8) is large, conical and quite prominent and is on the dorso-caudal part of the head. *Ocellus 2*, (02, fig. 8) is similar to ocellus 1 and is located cephalad on the dorso-lateral part of the head. *Ocellus 3* (03, figs. 5 and 8) is cephalo-ventrad of ocellus 2, and *ocellus 4* (04, figs. 5 and 8) is caudo-ventrad of ocellus 3. The remaining two ocelli are quite small and inconspicuous and appear as transparent convex spots. *Ocellus 5* (05, fig. 5) is ventrad and slightly caudad of ocellus 2. *Ocellus 6* (06, fig. 8) is caudo-mesad of ocellus 2.

Movable parts of the head.—The antenna is inserted on the dorsal aspect of the head laterad of each latero-clypeus. A slender, chitinized bar extends from the vertex, between the mandible and antenna, to the knob-like projection of the anterior arm of the tentorium (fig. 5). The *antenna* (figs. 22 and 23) is four-segmented, the second segment is the longest, the proximal and third segments are subequal and the distal segment is the shortest. The number

of setae on each segment, beginning with the proximal one, is 7, 9, 2, 3.

The *mandible* (*md*, fig. 8) is on the cephalo-lateral aspect of the head, cephalad of the antenna, and projects dorso-cephalad at an angle of about 45°. It is sickle-shaped (fig. 32) with a prominent, pointed tooth on the mesal margin about one-third the distance from the base. Opposite this tooth on the outer margin are four stout setae and at the base are several smaller ones. On its dorsal aspect at the base is a projection with an acetabulum which articulates with the knob-like projection of the anterior arm of the tentorium. On the ventral aspect of the mandible is a prominent condyle which articulates in an acetabulum on the postgenae.

The *maxilla* (*mx*, fig. 14) is somewhat flattened and is attached to the cephalic margin of the hypostoma. The *cardo* (*ca*, figs. 27 and 28) consists of two pieces. One part is on the ventral aspect, is somewhat triangular in shape, and bears a prominent setae at its distal point. This sclerite articulates with the hypostoma laterad of the attachment of the labium. The other part of the cardo is on the mesal and dorsal aspects of the maxilla, is strap-shaped, and articulates with the postgena adjacent to the point of attachment of the postgena with the clypeus. The *stipes* (*sti*, figs. 27 and 28) is the large, somewhat flattened and rectangular segment distad of the cardo. On its mesal margin at the base are four or five short, stout setae or spines. In the membrane at the distal end of the stipes is a small sclerite bearing three setae, possibly a rudiment of lacinia. The *galea* (*ga*, figs. 27 and 28) is the two segmented mesal appendage distad of the stipes. The proximal segment is about one-third longer than the distal segment. It bears three stout setae on its mesal margin and the distal segment bears five setae. The *palpifer* (*pf*, figs. 27 and 28) is laterad of the proximal segment of the galea and separated from it by a suture. It is subequal in length to the palpus and bears one seta on the ventral aspect and six on the dorsal. The *palpus* (*pa*, figs. 27 and 28) is the three-segmented appendage attached to the distal end of the palpifer. The proximal segment is the shortest and each succeeding segment slightly longer. The second segment bears two setae on the dorsal aspect and one on the ventral aspect.

The *labium* (*l*, figs. 14, 17, and 21) is attached by a membranous area to the cephalic end of the hypostoma. This membranous area probably represents the *mentum* and *submentum*. Its membranous nature allows of considerable movement of the labium. The fused *labio-stipites* (*ls*, fig. 17) is the chitinized area on the ventral surface of the labium. This sclerite has a deep furrow along the meson and extends cephalad as a triangular projection between the palpigera, with a long, stout seta on each side of the furrow. The *palpiger*

(*pg*, fig. 17) is laterad of the fused labio-stipites, is more or less membranous, and has two sclerites on the ventral aspect. These sclerites are separated by a flexible suture. The *labio-palpus* (*lp*, fig. 17) is two-segmented. The proximal segment bears at its ventro-distal end three prominent, pointed projections with two stout setae on the outer and two on the inner margin. The distal segment is about twice as long as wide and bears a single seta on its ventral aspect. The *ligula* (*li*, fig. 17) is the membranous area distad of the fused labio-stipites. Its ventral surface is anteriorly trilobed and crossed by a transverse row of four setae about one-half way between the point of attachment of the palpifers and the distal end. The entire dorsal or buccal surface of the labium (fig. 21) is membranous and is covered with numerous fine setae with a fringe of long setae on the dorso-lateral margins. *Maxillulae* or *paragnathae* (=paraglossae) are not present.

THORAX.

The thorax will be discussed under the divisions: The cervical region, the prothorax, the meso- and metathorax, and the legs.

Cervical region.—The *cervical region* consists mostly of membrane. Dorsally a triangular, chitinized area, the "*intertergite*" of Crampton, fits into the caudal, V-shaped margin of the head. There are two narrow, dark colored, longitudinal areas near the middle of this sclerite which extend entad at their caudal margin as narrow, straplike projections. Laterally and ventrally an irregular, indistinct, chitinized area, the "*interpleurite*" of Crampton, occurs on each aspect of the cervical region (*ip*, fig. 38). Each sclerite is transversed longitudinally by a row of minute setae and at the caudal margin is a small pit which is an invagination for the attachment of muscles. Ventrally the cervical region is entirely membranous and permits of considerable dorsal movement of the head. Its caudal extent is indicated by a shallow convex furrow.

Prothorax.—The prothorax is considerably specialized and, together with the head, is adapted to the larva's mode of living. The *pronotum* (*pn*, fig. 37) is large, heavily chitinized, highly colored, and shield shaped. The lateral parts of its cephalic margin are emarginate and permit a close contact with the caudal part of the head. The lateral angles extend cephalad as far as the meson; the caudo-lateral angles are broadly rounded, and the lateral margins extend upon the ventral aspect. There is a furrow along the meson and a short crescent-shaped furrow on each lateral half of the pronotum. The setae are short, white, slightly flattened, and arranged as shown in figures 37 and 54. A row or fringe of setae extends around the entire margin of the pronotum, becoming more numerous on the caudal part. The color of the pronotum varies

with the angle from which it is observed. Perpendicular to the horizontal plane it is purplish-bronze with a green reflection, while from an acute angle more green color is apparent.

The *pleurum* (*pl*, fig. 38) of the prothorax consists mainly of hypopleurum with its two irregular, chitinized areas, the pre- and post-hypopleurites, and epipleurum, which is greatly reduced and entirely membranous. The *coxal process of the hypopleurum* (*cwp*, fig. 38) is the dark, chitinized projection to which the coxa articulates. The *pleural suture* (*pls*, fig. 38) extends dorso-cephalad from this process as a dark, curved line. The *pre-hypopleurite* (*prh*, fig. 38) is the dark, irregular, chitinized area cephalad of this suture. Its cephalic part is inflexed dorso-cephalad. The *post-hypopleurite* (*poh*, fig. 38) consists of the irregular, chitinized sclerite extending laterad and caudad of the pleural suture. The caudal part of the post-hypopleurite bears five or six minute setæ. The *entopleurum* (*enp*, fig. 38) extends from the end of the pleural suture meso-caudad as a platelike projection and becomes broader at its distal end. The *epipleurum* is the membranous region caudad and slightly dorsad of the post-hypopleurite.

The *sternum* of the prothorax is the area on the ventral aspect caudad of the cervical region, mesad of the legs, and extending caudad to the invagination for the spina. The *presternum* (fig. 38) is either absent or included in the folded membrane of the cervical region. The *eusternum* (*eust*, fig. 38) is the area between the insertion of the coxæ and extending caudad to the furcal pits. It is entirely membranous except for a slightly chitinized region between the insertion of the legs, which bears four distinct setae and a number of smaller ones. Caudo-mesad of the legs are small pits which mark the invagination for the *furcæ* (*fu*, fig. 38). Between and behind these is *sternellum* (=furca-sternum Crampton). The *post-sternellum* (*postl*, fig. 38) (=spina-sternum Crampton) is the transverse region caudad of the sternellum. It is entirely membranous. Laterally are the small, slightly chitinized invaginations of the *furcellæ* (*fuca*, fig. 38) and on the median part is the more prominent, chitinized *spina* (Crampton) (*s*, fig. 38).

Meso- and Meta-thorax.—The mesothorax and metathorax are similar enough to be described together. They are narrower than the prothorax and are constricted at their cephalic end. The *terga* (*te*, fig. 37) are the somewhat cordiform, slightly convex, chitinized sclerites. The cephalic part of each sclerite is narrower and is produced into three or four pointed projections, which articulate with the sclerite in front of it. A suture extends along the meson dividing the terga into equal parts. The setae are brown, are more numerous on the lateral and caudal margins, and vary in size from

long and prominent to short and inconspicuous. They are arranged as shown in figure 37.

The meso- and meta-thoracic pleura (figs. 1 and 37), except for size, are similar in form and development. The *coxal process* (*cwp*, fig. 37) is black and heavily chitinized. The *pleural suture* (*pls*, fig. 37) extends dorso-cephalad from each coxal process and separates the *pre-hypopleurite* from the *post-hypopleurite*. Each post-hypopleurite bears five or six setae on its caudal part. The *entopleurum* is invaginated along the pleural suture. The *epipleurum* (*epl*, fig. 37) has a small, chitinized spot, bearing one to a few setae, caudad of the post-hypopleurite.

The *spiracle* (fig. 1) of the mesothorax is annular, large, brown, elliptical, and is on the lateral aspect in the intersegmental membrane between the mesothorax and prothorax. This spiracle is about twice the size of the spiracle on the first abdominal segment and three times the size of the remaining abdominal spiracles. There is no spiracle on the prothorax and only a rudimentary one on the meta-thorax.

Between the prothorax and mesothorax and the mesothorax and metathorax are the *intersegmental folds* (*if*, fig. 38). These folds are entirely membranous.

The sterna of the mesothorax and the metathorax are largely membranous. The *mesosternum* consists of presternum, eusternum, sternellum, and poststernellum, while in the *metasternum* the poststernellum is absent. Each *presternum* (*pst*, fig. 38) has on its lateral side a small, chitinized spot bearing a single seta, and each *eusternum* (*eust*, fig. 38) has a larger, median, chitinized spot bearing four setae. Caudo-mesad of each leg are the small pits which mark the invagination for the *furcae* (*fu*, fig. 38), and behind these we have *sternellum* posteriorly reaching to the invaginations for *furcellae*. The *poststernellum* with *spina* is only present on the mesothorax and is entirely membranous. An eversible structure (fig. 38), probably a gland, is located on the meson of the presternum of the metathorax.

Legs.—The legs of the prothorax, mesothorax, and metathorax are very similar and can conveniently be described together. The length of the legs increases gradually, but slightly posteriorly. The *coxa* (*cx*, fig. 33) is almost as long as the remaining segments of the leg, subcylindrical, and articulates at its proximal end by a dark and heavily chitinized acetabulum to the coxal process of the hypopleurum. The *trochantin* (*trn*, fig. 33) is separated from the proximal end of the coxa by a shallow furrow. The trochantin and the furrow which separates it from the coxa are more pronounced and larger in each of the following pairs of legs. The *trochanter*

(*tro*, fig. 33) is approximately one-third the length of the coxa and articulates to the coxa at its proximal end by a pair of condyles. The ventral surface of the trochanter is much longer than its dorsal surface. The *femur* (*fe*, fig. 33) is attached to the dorsal surface at the distal end of the trochanter. It is about twice as long as the trochanter and is slightly larger at its distal end. The *tibia* (*ti*, fig. 33) is short, cylindrical, and attached obliquely to the distal end of the femur. The *tarsus* (*ta*, fig. 33) is still shorter and bears at its distal end two curved *claws*. Both claws are movable by muscles. The cephalic claw is about one-half longer than the caudal one. The setae on the segments of the legs are arranged as shown in figure 33.

ABDOMEN.

The abdomen (fig. 1) is ten-segmented, subcylindrical, and gradually increases in size to the fifth segment, from which one it gradually decreases to the caudal segment. All of the segments are quite similar except the fifth and the last three. The tergum, pleurum, and sternum are easily distinguished, and a description of one segment will suffice for all except the fifth and the last three. The third abdominal segment is the one chosen for this description. The segment consists principally of membrane, but has a number of distinct chitinized areas.

The *tergum* (*te*, fig. 96) has a pair of suboval sclerites, one on each side of the meson. These sclerites bear four or five long, prominent setae and several smaller ones.

The *pleurum* consists of two distinct regions, the epipleurum and hypopleurum, separated from each other by the indistinct *ventro-lateral suture*. The *epipleurum* (*epl*, fig. 96) has a single large, chitinized sclerite with several setae, and usually three small, chitinized spots carrying a single seta. The *hypopleurum* (*hy*, fig. 96) also contains a single large, oval sclerite with a number of setae, and three small chitinized spots bearing a single seta.

The *sternum* consists of several chitinized areas, namely, the eusternum, sternellum (=intersternellum, Lengerken), and coxal lobes (=extrasternellum, Lengerken). The *eusternum* (*eust*, fig. 96) is the single large sclerite on the cephalo-mesal part. It bears four pair of setae. There are three small chitinized spots, bearing a single seta, cephalo-laterad of the eusternum. The *sternellum* (*stl*, fig. 96) consists of a pair of oval sclerites, one on each side of the meson, caudad of the eusternum. These sclerites bear four or five setae. The large, suboval sclerites laterad of the sternellum are the *coxal lobes* (*cwl*, fig. 96). They bear four or five prominent setae and several smaller ones. The number and arrangement of the setae on the segment are shown in figure 96.

In the eighth segment (figs. 1 and 42) the eusternum, sternellum, and coxal lobes are fused to form a single sclerite. On the ninth segment (fig. 42) this chitinized area includes the sclerite of the hypopleurum. The caudal margin of this fused sclerite bears four setae in a transverse row on each side of the meson. The tenth segment (figs. 1 and 42) is greatly reduced in size, the sclerites of the tergum, pleurum, and sternum are fused to form a ring, and the whole structure has the character of what Kemner calls a *pygopod*.

The tergum of the fifth abdominal segment (fig. 40) is produced into a prominent hump bearing two distinct chitinized areas on each side of the meson with two hooks between each of these sclerites. The caudal sclerites are somewhat crescent-shaped, and their cephalic margin is thickly studded with short, stout setae. The cephalic sclerites are somewhat triangular with the base toward the meson. They are not as heavily chitinized as the caudal sclerites and have only about half as many setae, which are longer but not so stout. Between these sclerites on each side of the meson are two hooks. One of these hooks is long, sickle-shaped, extends cephalad with the point outward, and usually bears two distinct setae at about the middle. These hooks are named the "*median hooks*" (*mh*, fig. 40), since in some of the other genera there is a third pair of hooks laterad of these median hooks which have been named the "*lateral hooks*." Mesad of each median hook is a shorter pointed hook. These hooks are not curved and project dorso-cephalad. The distal part is pointed and has a distinct shoulder which bears two prominent setae. These hooks have been named "*inner hooks*" (*ih*, fig. 40).

Spiracles are found on the first eight abdominal segments. They are small, annular, and appear as brown spots on the lateral part of the tergum about one-third the distance from the cephalic margin (fig. 1). The first abdominal pair are slightly larger than the following pairs.

SETAE

Larvae of the different instars were available for study in several species of the genus *Cicindela*. This material was studied to determine whether any relation existed between the number and arrangement of the setae in the different instars of the same species and the corresponding instars of different species. In the first larval instar of the species studied it was found that a striking similarity existed in the number and arrangement of the setae on the pronotum and abdomen. These same setae were usually easily distinguished in the second and third instars even though in some cases there was a considerable number of setae added. For this reason the setae present in the first larval instar have been designated as "*primary*

setae” and those added in the second and third instars as “*secondary setae*.” To facilitate referring to them the primary setae on the pronotum have been numbered. Their position and nomenclature is shown in figures 49 to 57. On the abdomen primary and secondary setae appear to be present, but their homology was not determined sufficiently to give them numbers. Their number and position is indicated in figures 88 to 93.

In the genera *Tetracha* and *Omus* limited studies indicate the presence of primary and secondary setae. There was not a sufficient amount of material available, however, to make it possible to indicate these by numbers. The setae on the pronotum of the first, second, and third instars and on the third abdominal segment of the first and third instars of *Omus californicus* are shown in figures 82 to 84 and 118 and 119.

No immature larvae of the genus *Amblychila* were available for study.

DISCUSSION OF THE CHARACTERS USED IN CLASSIFICATION.

All measurements have been made with a binocular microscope and an eye-piece micrometer. One of the best uses which can be made of measurements, as has been determined by a number of workers on various species of insects, is the proportional length of one structure to another. This proportion is constant for individuals of different sizes of the same species, and often for the different instars. The proportional length to the width of the frons, the proportional diameter of ocellus 2 to the distance between ocelli 1 and 2, the proportional length of the segments of the antennae, and the length and width of the pronotum are good characters. In general, ocelli 1 and 2, the homology of which is indicated in figures 5 and 8, are very much the same size in the large and small species of the genus *Cicindela*, but they appear to be larger in the smaller species due to the smaller size of the head. As a result, in the smaller species, the distance between ocelli 1 and 2 is generally less than the diameter of ocellus 2.

The proportional length of the segments of the maxillary palpus furnish excellent generic characters but do not vary enough within the genera to be of specific value. The position of the cephalo-lateral angles of the pronotum with respect to the cephalo-mesal part and the general shape of the pronotum varies considerably in the species of the genus *Cicindela*.

The setae on the dorsal aspect of the head and pronotum, and on the abdomen provide further characters for separating the species. In the genus *Cicindela* the setae on the U-shaped ridge on the caudal part of the frons are very constant in number for those species which have only two. These are usually large and easily distinguished. In

the species which have three setae on this U-shape ridge there may occasionally be one or two extra setae present. These are usually small and in a few cases the third seta is not prominent. In the genus *Tetraocha* there are three prominent setae on the transverse ridge at the caudal part of the frons while in the genus *Omus* there is a single large, median seta with one or two smaller setae on each side. The setae on the proximal and second segments of the antennae vary within the limits given in the descriptions but usually not more than one on either side of the average. Setae on the hooks of the fifth abdominal segment are constant in number for those species which have two, but vary in those species which have three or more. On each side of the meson at the caudal margin of the ninth abdominal sternum is a transverse row of three, four, or five setae. These setae are constant and furnish good taxonomic characters.

The dorsal aspect of the head and pronotum is very highly colored in many of the species and, within certain limits, furnishes excellent means for separating them. The color is of two kinds, pigmental and physical. The pigmental colors are dull, usually some shade of brown, and appear the same when examined from any angle. The physical colors are much brighter and are produced by small pit-like depressions. These colors vary with the angle from which the specimen is examined. The surface, when examined with a strong light, may show any of the following colors: Purple, purplish-bronze, coppery, coppery-bronze, bronze, blue, and green. When viewed from an obtuse or acute angle the blue or green color is usually more pronounced and this is spoken of as the color which is reflected.

GENERAL DISCUSSION OF LIFE HISTORY AND HABITS OF LARVAE

The larvae of this family differ from the larvae of most other predaceous insects in that they live in a definite fixed burrow and lie in wait for their prey. This habit has made them dependent upon chance for their food supply and undoubtedly it is very irregular and at times not plentiful. As a result the length of the larval instars may vary considerably, depending upon the food supply, temperature, and the length of the growing or feeding season.

The life history of different species of *Cicindela* as given by Shelford (1908) for northern Illinois is of three types and is as follows:

(a) Eggs laid in late spring or early summer, larvae hibernate usually in the third stage, pupate in the second summer; imagoes emerge about a month after pupation, hibernate, and become sexually mature late in the third spring—larval life lasts 12 to 13 months, adult life 10 months—two years between generations.

(b) Eggs laid in mid summer, larvae hibernate usually in the third stage, pupate in the following June; imagoes emerge in early July and become sexu-

ally mature very soon—larval life 10 months, adult life two months—one year between generations.

(c) Eggs laid in mid summer; larvæ hibernate in the second stage, reach the third stage early in the second summer, hibernate again, and pupate in the following May; imagoes emerge in the early part of the third summer and become sexually mature soon—larval life 21 months, adult life 2 months—two years between generations.

That the time spent in the larval stage is influenced by temperature, length of the summer or growing season, and possibly other factors is shown by Criddle (1910):

It will be noticed, however, that there is a striking difference in the life cycle of some of the species, observed by Professor Shelford at Chicago and those noted by me at Aweme, even when the same, or a closely related form, is involved, the difference being the prolongation of the larval life over a second winter in Manitoba. This seemed to be such a remarkable fact, considering that there are less than 600 miles of latitude between the two places, that I felt almost persuaded that some mistake had been made on my part, and consequently decided to make further investigations before publishing these notes. The results have been to leave no doubt that the life cycle of species carefully observed—*C. manitoba*, *venusta*, *limbata*, *limbalis*, and probably others—lasts for approximately three years; duration of larval stage 24 to 26 months, pupal 2 to 4 weeks, adult 10 to 12 months.

Many of the larvæ are very restricted in their habitat, occurring only in particular kinds of soil and requiring a certain amount of moisture. *Cicindela 12-guttata*, *repanda*, and *hirticollis* leave their burrows if the soil becomes too dry and seek new places which are sufficiently moist. The female oviposits in small holes about 1 centimeter deep in soil which is suitable for the development of the larvæ. The larva, upon hatching, deepens and widens this burrow and lives in it unless conditions become unfavorable for its development. Before each molt the larva closes the burrow, goes to the bottom, molts, and reappears again in about one week. There are only three larval instars in the life cycle. When the larva is ready to pupate it makes a pupal chamber or burrow, generally at one side of the main burrow, in which it pupates. The depth of the larval burrow, whether it is perpendicular to the surface, spiral, or slanting, and the character of the pupal chamber, is characteristic for each species. These larval habitats aid in separating many of the species.

CLASSIFICATION

The characters used in the classification and the descriptions of the larvæ were not taken from a single type specimen but are an average of the number of specimens in the collection. In some cases only a single larva was available; in other species there was an abundance of larval material.

For each species there has been given the name of the collector, a statement as to whether the larvae were reared or not reared, and the place where the larvae are deposited. Species marked "reared" have had the larvae reared for determination, but the cast skins were not saved and comparisons were not made with the larvae used in the descriptions. Species marked "not reared" have not had the larvae reared for determination, but in most instances all the other species of the community were reared or their habits were so restricted and characteristic that there was but little doubt they were larvae of adults caught in the habitat. Several unknown larvae with suggested determinations have been included. Their names have been derived through a study of the distribution of the adults and a comparison of the larval structures and habitats with known material.

Family CICINDELIDAE.

Larvae of medium length, cylindrical; head and pronotum strongly chitinized, wider than the remainder of the body and inclined ventro-cephalad; head concave on the dorsal aspect, strongly convex on the ventral; clypeus and labrum fused with the frons; ocelli, four or six on each side of the head, ocelli 1 and 2 larger than the others, ocelli 5 and 6 sometimes absent; antenna four-segmented; mandible sickle-shaped with a prominent tooth on the middle of the mesal margin, inclined dorso-cephalad at an angle of about 45 degrees; maxilla with the ventral sclerite of the cardo more or less triangular, stipes considerably longer than wide, galea two-segmented, proximal segment of the galea and the palpifer fused; maxillary palpus two or three segmented; labial palpus two-segmented; pronotum large, shield shaped, heavily chitinized, and fitting close against the caudal margin of the head; legs, long, tarsus usually with two movable claws, the cephalic claw longer than the caudal; abdomen with ten distinct segments, fifth segment with a dorsal protuberance bearing two or three pairs of hooks; cerci wanting; spiracles lateral, annular and present on the mesothorax and first eight abdominal segments.

The family characters of the larvae have been determined from examination of specimens representing the four genera occurring in the United States, two European genera, and several tropical genera which have not been definitely determined, the larvae of which live in burrows in twigs. It is in those larvae living in burrows in twigs that the tarsal claws are wanting as distinctly movable claws. In the wood burrowing larvae the tarsus is produced into two blunt projections serving as claws. I have not examined enough species to definitely state whether this is a generic or specific character.

TABLE TO THE GENERA OF CICINDELIDAE.

- | | |
|---|---|
| Ocelli 1 and 2 subequal in size..... | 1 |
| Ocellus 2 distinctly smaller than ocellus 1..... | 4 |
| 1. Lateral hooks not present; legs with distinct, movable tarsal claws.... | 2 |
| Lateral hooks present and produced at the anterior end of a chitinized area, laterad of the median hooks; legs without distinct tarsal claws, tarsus and claw combined..... | 3 |
| 2. Median hooks long, curved and sickle-shaped, pointing outward; inner hooks short, cylindrical and usually with the distal end suddenly constricted into a spine-like projection; ridge on the caudal part of frons U-shaped and not joining the ridge on the caudal part of the vertex; palpiger with a distinct chitinized sclerite, proximal segment of labial palpus with two or three spine-like projections on its ventro-distal margin....Genus 1. <i>Cicindela</i> , p. 16. | |
| Median hooks thorn-like, straight or very slightly curved inward; inner hooks similar in shape to the median hooks and about one-half as long; ridge on the caudal part of frons transverse and joining the ridge on the caudal part of the vertex; palpiger membranous, proximal segment of labial palpus without spine-like projections on its ventro-distal margin. | |
| Genus 2. <i>Tetracha</i> , p. 57. | |
| 3. Head with the ridge on the caudal part of frons U-shaped and not continuous with the ridge on the caudal part of the vertex; arms of the epicranial suture uniting and frons not extending to the occiput. | |
| Genus 3. <i>Collyris</i> , p. 61. | |
| Head with the ridge on the caudal part of the frons slightly sinuate and continuous with the ridge on the caudal part of the vertex; arms of the epicranial suture not uniting and frons extending to the occiput. | |
| Genus 4. Probably <i>Ctenostoma</i> , p. 63. | |
| 4. Antenna not separated from the mandible by a transverse chitinized bar, second segment not twice as long as the proximal segment; palpiger with a distinct chitinized sclerite, proximal segment of labial palpus with a single spine-like projection on its ventro-distal margin, proximal segment longer than the distal segment; lateral hooks present....Genus 5. <i>Omus</i> , p. 65. | |
| Antenna separated from the mandible by a transverse, chitinized bar, second segment twice as long as the proximal segment; palpiger without a chitinized sclerite, proximal segment of labial palpus without spine-like projections on its ventro-distal margin, proximal segment shorter than the distal segment; lateral hooks absent.....Genus 6. <i>Amblychila</i> , p. 69. | |

1. Genus *CICINDELA* Linnaeus.

Head with the ridge on the caudal part of frons U-shaped and not continuous with the ridge on the caudal part of the vertex; lateroclypeus distinct, rectangular; anterior margin of the labrum smooth; ocelli 1 and 2 subequal in size, ocellus 3 larger than ocellus 4, and not adjacent, ocelli 5 and 6 small and inconspicuous; antenna separated from the mandible by a narrow, transverse, chitinized bar, the second segment not longer than the other segments combined; maxilla with the ventral sclerite of the cardo triangular and bearing a single seta, lacinia apparently absent, maxillary palpus with three, but occasionally two segments, increasing slightly in length from the proximal to the distal segment, the proximal segment with-

out a spine on the latero-distal margin; labio-stipites with a furrow along the meson and without a carina on the lateral and caudal margins; ligula not chitinized on the ventral aspect, palpiger area with two chitinized sclerites separated by a flexible suture; labial palpus with the proximal segment longer than the distal segment and with two or three spine-like projections on its ventro-distal margin, the proximal segment with four or five setae and the distal segment with one; fifth abdominal segment with the inner and median hooks present, the lateral hooks wanting, the median hooks long, slender, sickle shaped, pointing outward and usually with one to four setae, inner hooks short, cylindrical and constricted at the distal end into a sharp spine and with two to a number of setae; legs with distinct, movable tarsal claws.

The larvae described in this genus contain a number of species and subspecies from the United States and several from Europe. Among those described from the United States there are several which have not been positively identified and a few which are unknown. These are included with the expectation that the larvae may later be reared and their identity established.

TABLE TO THE SPECIES OF THE GENUS *CICINDELA*.

1. Maxillary palpus with three segments.....	3
Maxillary palpus with two segments.....	2
2. U-shaped ridge on caudal part of frons bearing four or six setae; pronotum with the secondary setae numerous, more than 150 in number; ninth abdominal sternum with the caudal margin bearing two groups of three setae each.....	<i>dorsalis sauleyi</i> , p. 20.
U-shaped ridge on caudal part of frons bearing two setae; pronotum with the secondary setae not numerous, less than 50 in number; ninth abdominal sternum with the caudal margin bearing two groups of four setae each.....	<i>biramosa</i> , p. 21.
3. U-shaped ridge on caudal part of frons bearing two distinct setae.....	4
U-shaped ridge on caudal part of frons bearing three or four distinct setae.....	25
4. Inner hook never with more than two setae on the shoulder; setae on head and pronotum usually white, rarely transparent or brown.....	5
Inner hook with more than two setae on the shoulder; setae on head and pronotum transparent or glassy.....	23
5. Pronotum chestnut brown.....	6
Pronotum not chestnut brown.....	8
6. Head chestnut brown; pronotum without a color pattern.....	7
Head bronze; pronotum with a color pattern of lighter areas.....	<i>species A</i> , p. 22.
7. Setae on head and pronotum brown.....	<i>sexguttata</i> , p. 23.
Setae on head and pronotum white or transparent.....	<i>campestris</i> , p. 24.
8. Median hooks with one or two setae; if with three, one seta much smaller than the others.....	9
Median hooks with three distinct setae.....	15

9. Inner hooks with the spinelike projection one-third or more the entire length of the hook..... 10
 Inner hooks with the spinelike projection never more than one-sixth the entire length of the hook..... 14
10. Inner hooks with the spinelike projection more than one-half the entire length of the hook..... limbata, p. 25.
 Inner hooks with the spinelike projection one-half or less than the entire length of the hook..... 11
11. Pronotum with the secondary setae wanting except a single large one cephalo-lateral of seta 4..... purpurea graminea, p. 27.
 Pronotum with the secondary setae small, 10 or more in number..... 12
12. Ninth abdominal sternum with the caudal margin bearing two groups of three setae each..... 13
 Ninth abdominal sternum with the caudal margin bearing two groups of four setae each..... species B, p. 28.
13. Antenna with the proximal segment bearing five to seven setae, the second segment with ten to twelve; median hooks with three setae.
 latesignata, p. 29.
 Antenna with the proximal segment bearing ten to twelve setae, the second segment with six to eight; median hooks with one seta..... species C, p. 30.
14. Pronotum with the secondary setae few, not more than ten in number; antenna with the proximal segment bearing ten to eleven setae; median hooks normally with a single large seta, if two are present one much smaller than the other..... repanda, p. 31.
 Pronotum with the secondary setae numerous, 50 or more in number; antenna with the proximal segment bearing six or seven setae; median hooks with two setae..... lepida, p. 32.
15. Inner hooks with the spinelike projection about one-sixth the entire length of the hook, the setae inserted on a broad shoulder; pronotum with the cephalo-lateral angles distinctly caudad of the cephalo-mesal portion.
 gratiosa, p. 34.
 Inner hooks with the spinelike projection about one-third or more the entire length of the hook, the setae inserted on a sloping shoulder; pronotum with the cephalo-lateral angles not distinctly caudad of the cephalo-mesal portion..... 16
16. Ninth abdominal sternum with the caudal margin bearing two groups of more than three setae each..... 17
 Ninth abdominal sternum with the caudal margin bearing two groups of three setae each..... 19
17. Ninth abdominal sternum with the caudal margin bearing two groups of four setae each..... 18
 Ninth abdominal sternum with the caudal margin bearing two groups of five setae each..... species D, p. 34.
18. Head and pronotum bright coppery bronze with a strong bluish-green reflection; distance between ocelli 1 and 2 less than the diameter of ocellus 2.
 tranquebarica, p. 36.
 Head and pronotum purplish bronze with a purple reflection; distance between ocelli 1 and 2 greater than the diameter of ocellus 2.
 silvicola, p. 37.
19. Antenna with the proximal segment bearing 8 to 11 setae..... 20
 Antenna with the proximal segment bearing five or six setae..... 22
20. Pronotum with the secondary setae 25 to 30 in number and with a row on each side of the meson, the blue reflection very strong.
 oregona, p. 38.

- Pronotum with the secondary setae not more than 10 in number and without a row on each side of the meson, the blue reflection not strong. *duodecimguttata*, p. 39.
21. Inner hook with the two setae located equidistant from the tip; mesal hook with the three setae located in a row----- 22
 Inner hook with the outer setae located nearer the tip; median hook with the three setae not in a row, the distal one placed nearer the mesal side of the hook----- *germanica*, p. 40.
22. Head and pronotum bronze with a slight blue reflection; diameter of ocellus 2 less than the distance between ocelli 1 and 2----- *punctulata*, p. 41.
 Head and pronotum dark purple with a green or blue reflection; diameter of ocellus 2 subequal to or greater than the distance between ocelli 1 and 2----- *flavopunctata rectilatera*, p. 42.
23. Pronotum with the cephalo-lateral angles extending distinctly cephalad of the mesal portion----- *unipunctata*, p. 43.
 Pronotum with the cephalo-lateral angles not extending distinctly cephalad of the mesal portion----- 24
24. Inner hooks bearing three prominent setae, the spinelike projection almost obsolete----- *abdominalis*, p. 44.
 Inner hooks bearing 10 or 11 prominent setae, the spinelike projection distinct----- *marginata*, p. 45.
25. Proximal segment of the galea with four stout setae on the mesal margin; head and pronotum light brown; diameter of ocellus 2 distinctly less than the distance between ocelli 1 and 2----- 26
 Proximal segment of the galea with three stout setae on the mesal margin; head and pronotum not brown, metallic colored; diameter of ocellus 2 subequal to or greater than the distance between ocelli 1 and 2----- 27
26. Median hook bearing two distinct setae; average width of head and pronotum 4.5 mm----- *formosa*, p. 46.
 Median hooks bearing three distinct setae; average width of head and pronotum 4.0 mm----- *formosa generosa*, p. 47.
27. Inner hooks bearing more than two setae----- *scutellaris lecontei*, p. 48.
 Inner hooks bearing two setae----- 28
28. Pronotum with the secondary setae few, not over 15 to 20, fine and inconspicuous----- 29
 Pronotum with the secondary setae numerous, 50 or more, short, flat, and prominent----- 31
29. Pronotum dark purple with a green or blue reflection, lateral margins not lighter; median hooks with two setae----- 30
 Pronotum bright bronze with a faint green or purple reflection, lateral margins light yellow; median hooks with three or four setae. *cuprascens macra*, p. 49.
30. Pronotum with the cephalo-lateral angles extending as far cephalad as the mesal part; setae on the third abdominal segment as in figure 113. *pulchra*, p. 51.
 Pronotum with the cephalo-lateral angles not extending as far cephalad as the mesal part; setae on third abdominal segment as in figure 169. *obsoleta*, p. 51.
31. Ninth abdominal sternum with the caudal margin bearing two groups of three setae each; pronotum with the secondary setae numerous, distinctly more than 100 in number; median hooks with less than four setae----- 32

- Ninth abdominal sternum with the caudal margin bearing two groups of four setae each; pronotum with the secondary setae not numerous, about 50 in number; median hooks with four setae.....hybrida, p. 53.
32. Pronotum with the cephalo-lateral angles not extending as far cephalad as the mesal part; either the proximal or second segment of the antenna with less than 12 setae..... 33
- Pronotum with the cephalo-lateral angles extending as far cephalad as the mesal part; both the proximal and second segments of the antenna with 12 or more setae.....hybrida maritima, p. 54.
33. Pronotum with the secondary setae distinctly flattened and quite numerous; antenna with the proximal segment bearing seven to nine setae; median hooks with two setae.....hirticollis, p. 55.
- Pronotum with the secondary setae not distinctly flattened and only about one-half as numerous as the above; antenna with the proximal segment bearing 12 to 13 setae; median hooks with 3 setae.....limbata, p. 56.

DESCRIPTION OF SPECIES.

CICINDELA DORSALIS SAULCYI Guérin.

Figs. 78, 115, and 147.

SHELFORD, reared, larvae in collection of the University of Illinois.

Color.—Head and pronotum bright coppery bronze with a strong blue reflection; setae on dorsal aspect of head and pronotum transparent or glassy, the other setae brown.

Head.—Setae on dorsal aspect fine and inconspicuous; diameter of ocellus 2 distinctly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on the caudal part of the frons bearing four or six setae, the two middle ones larger than the others; antenna, with the proximal segment slightly shorter than the second, the third about two-thirds and the fourth one-third the length of the second, the proximal segment with five or six setae and the second with nine or ten; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus two-segmented, the first and second segments fused and together as long as the distal segment; ligula with four fine setae on the ventro-distal end arranged in a transverse row, proximal segment of labial palpus with three spine-like projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-mesal portion extending distinctly cephalad of the cephalo-lateral angles, lateral margins not carinate, primary setae small and not conspicuous, secondary setae short, fine, and numerous (fig. 78).

Abdomen.—Chitinized areas indistinct; secondary setae few, short, and inconspicuous (fig. 115); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median

hooks with two setae, inner hooks with six or seven setae, the spine-like projection about one-fifth the length of the hook (fig. 147).

Measurements.—Length of larva, 15 to 17 mm., width at the third abdominal segment, 1.4 to 1.6 mm.; diameter of ocellus 2, 0.32 to 0.34 mm.; distance between ocelli 1 and two, 0.19 to 0.21 mm.; length of fronto-clypeo-labral area, 1.25 to 1.35 mm., width, 1.25 to 1.35 mm.; length of pronotum, 1.5 to 1.7 mm., width, 2 to 2.3 mm.

This species is easily distinguished from all others by the two-segmented labial palpus, which has apparently occurred through the fusion of the proximal and second segments. The larvae were collected at Galveston, Tex., on Denver Beach, from moist, clean sand, outside of the shrubs, which is probably covered by highest tides. It occurs in situations similar to those of *C. hirticollis* along the New England coast and around the shores of Lake Michigan. The burrows are from 12 to 18 inches in depth.

CICINDELA BIRAMOSA Fabricus.

Figs. 149, 161, and 173.

HORN, W., reared, larva in the collection of the University of Illinois.
1899, HORN, W., Deutsche Ent. Zeitschr., p. 385.

Color.—Head and pronotum bright coppery to yellow with a blue to green reflection, lateral margins slightly yellow; setae on dorsal aspect of head and pronotum transparent or glassy, the other setae brown.

Head.—Setae on dorsal aspect fine and inconspicuous; diameter of ocellus 2 distinctly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on the caudal part of frons bearing two setae; antenna with the proximal and second segments sub-equal, the third slightly more than two-thirds and the fourth slightly less than one-half the length of the second, the proximal and second segments each with six or seven setae; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus two-segmented, the proximal and second segments fused and together longer than the distal segment; ligula with four fine setae arranged in a transverse row at the ventro-distal end, proximal segment of labial palpus with three spine-like projections on its ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-mesal portion extending distinctly cephalad of the cephalo-lateral angles, lateral margins not carinate, primary setae long but not conspicuous, secondary setae medium size, inconspicuous and not numerous (fig. 149).

Abdomen.—Chitinized areas indistinct; secondary setae few, short, and inconspicuous (fig. 161); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with three setae; inner hooks with 8 to 10 setae, the spine-like projection not more than one-sixth the length of the hook (fig. 173).

Measurements.—Length of larva, 18 mm.; width at the third abdominal segment about 2 mm.; diameter of ocellus 2, 0.45 mm.; distance between ocelli 1 and 2, 0.30 mm.; length of fronto-clypeo-labral area, 1.6 mm.; width, 1.6 mm.; length of pronotum, 1.6 mm.; width, 2.7 mm.

The larva of this species is from India and was collected by Walter Horn. The nearest American form that I have studied is *Cicindela dorsalis saulcyi* and in many respects the two are quite similar. *Cicindela biramosa* is the larger of the two species and may be separated from *Cicindela dorsalis saulcyi* by the two setae on the U-shaped ridge, the ninth abdominal sternum bearing two groups of four instead of three setae each, the median hooks with three setae and the inner hooks with 8 to 10 setae.

CICINDELA, species A.

(Probably CICINDELA TRIFASCIATUS SIGMOIDEA LeConte.)

Figs. 59, 95, and 125.

SHELFORD, San Diego, California, not reared, larvae in the collection of the University of Illinois.

Color.—Head dark purplish brown, pronotum brown with a color pattern of lighter areas; setae on head and pronotum white, the other setae brown.

Head.—Setae or dorsal aspect medium in length and prominent; diameter of ocellus 2 equal to the distance between ocelli 1 and 2; fronto-clypeo-labral area slightly wider than long; U-shaped ridge on the caudal part of frons bearing two setae; antenna with the proximal segment slightly shorter than the second, the third two-thirds and the fourth one-half the length of the second, the proximal segment with nine or ten setae and the second with eight or nine; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spine-like projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal portion, lateral margins not cari-

nate, primary setae large and prominent, seta 7 wanting, secondary setae not more than ten in number and small (fig. 59).

Abdomen.—Chitinized areas distinct, secondary setae short, few and not conspicuous (fig. 95); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with four setae; inner hooks with two setae, the spine-like projection one-third the length of the hook (fig. 125).

Measurements.—Length of larvae 17 to 19 mm., width at the third abdominal segment, 2.4 to 2.6 mm.; diameter of ocellus 2, 0.29 to 0.31 mm.; distance between ocelli 1 and 2, 0.26 to 0.28 mm.; length of fronto-clypeo-labral area, 1.10 to 1.15 mm., width, 1.20 to 1.25 mm.; length of pronotum, 1.6 to 1.7 mm., width, 2.5 to 2.7 mm.

The larvae were collected at San Diego, California, on the beach in the tide flats just above high tide. They were taken from sand covered with mud and from pure sand. The holes were from 1½ to 3 inches deep.

CICINDELA SEXGUTTATA Fabricius.

Figs. 58, 94, and 124.

SHELFORD, reared, larvae in collection of University of Illinois, the U. S. National Museum and author's collection.

1908, SHELFORD, Journ. Linn. Soc. Lond., Zool., vol. 30, pp. 172-173.

Color.—Head and pronotum dark chestnut brown or purplish brown with a slight green or blue reflection, lateral margins of pronotum lighter in some specimens; setae brown.

Head.—Setae on dorsal aspect long, slightly flattened and prominent; diameter of ocellus 2 equal to the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on the caudal part of frons bearing two setae; antenna with the proximal and second segments subequal in length, the third two-thirds and the distal one-half the length of the second, the proximal segment with five or six setae and the second with nine or ten; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spinelike projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal portion, lateral margins slightly carinate, primary setae large, prominent, and slightly flattened, secondary setae small and not numerous (fig. 58).

Abdomen.—Chitinized areas distinct; secondary setae short, fine, and not numerous (fig. 94); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks generally with three setae, inner hooks with two setae, the spine-like projection about one-third the length of the hook (fig. 124).

Measurements.—Length of larva, 20 to 24 mm., width at the third abdominal segment, 2 to 2.5 mm.; diameter of ocellus 2, 0.25 to 0.28 mm.; distance between ocelli 1 and 2, 0.25 to 0.28 mm.; length of fronto-clypeo-labral area, 1.5 to 1.7 mm.; width, 1.5 to 1.7 mm.; length of pronotum, 1.8 to 2 mm., width, 2.9 to 3.2 mm.

The larvae of this species can be easily distinguished from those of other species by the brown setae on the head and pronotum. The larva is very characteristic in its habitat, which is quite different from most others, as stated by Shelford (1908):

This species does not deposit eggs in pure humus, but makes use of little irregularities in clay or sand which contains a little humus and which is shaded slightly, such conditions as are afforded by falling trees and the erosion of hillsides by small brooks. It prefers a few loose leaves, and will lay eggs under them in preference to other places when they are present. It does not, however, appear to like very shady conditions. Several days spent in the beech and maple forests of northern Indiana has failed to reveal the presence of one of these insects, although they were present in open and partly cleared places a short distance away, where the forest has not become so mesophytic.

The eggs are laid in June or early July in the shade, and the majority of the larvae reach the third stage by fall. The larvae pupate the following year in July, and the adults emerge in August. In northern Illinois the adults rarely appear in autumn, and it is probable that they remain in the pupal chamber until spring. There are two years between generations.

Larvae were collected by Professor Shelford from Suman, Indiana, Clinton and Lafollette, Tennessee, in 1908, and by the author from Urbana, Illinois, in 1916, and College Park, Maryland, in 1922.

CICINDELA CAMPESTRIS Linnaeus.

Figs. 150, 162, and 174.

E. ROSENBERG, Seeland, Denmark, 2 larvae, and MEINERT, 1890, Zool. Mus., Copenhagen, 2 larvae and 1 pupa, deposited in United States National Museum by Dr. A. Böving.

Color.—Head and pronotum dark chestnut brown, shiny, lateral margins of pronotum lighter, setae white.

Head.—Setae on dorsal aspect medium length, prominent; diameter of ocellus 2 slightly less than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on caudal part of frons bearing two setae; antenna with the proximal and second segments subequal in length, the third two-thirds and the

distal one-half the length of the second, the proximal segment with five or six setae and the second with seven or eight; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spinelike projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending as far cephalad as the mesal portion, lateral margins slightly carinate, primary setae not large, distinctly flattened, nor prominent; secondary setae small and not numerous (fig. 150).

Abdomen.—Chitinized areas distinct; secondary setae short, fine, and not numerous (fig. 162); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with three setae; inner hooks with two setae, the spinelike projection about one-half the length of the hook (fig. 174).

Measurements.—Length of larva, 22 to 26 mm.; width at the third abdominal segment, 2.5 to 3 mm.; diameter of ocellus 2, 0.22 to 0.24 mm.; distance between ocelli 1 and 2, 0.26 to 0.28 mm.; length of fronto-clypeo-labral area, 1.7 to 1.9 mm.; width, 1.7 to 1.9 mm.; length of pronotum, 1.9 to 2.1 mm.; width, 3.6 to 3.8 mm.

The larva of this species is quite similar to that of *senguttata*, but can be distinguished from it by the different colored setae on the head and pronotum and the longer spinelike projection on the inner hooks. This species is an European form and does not occur in the United States.

CICINDELA LIMBALIS Klug.

Figs. 1, 5, 6, 7, 8, 14, 17, 21, 22, 23, 27, 28, 32, 33, 37, 38, 39, 40, 42, 52, 53, 54, 96, and 126.

SHELFORD, reared, larvae in the collection of the University of Illinois and the author's collection.

1908, SHELFORD, Journ. Linn. Soc. Lond., Zool., vol. 30, pp. 164-165.

Color.—Head and pronotum dark purple with a green reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect long, slightly flattened and prominent; diameter of ocellus 2 distinctly less than the distance between ocelli 1 and 2; fronto-clypeo-labral area slightly wider than long; U-shaped ridge on the caudal part of frons bearing two setae; antenna with the proximal segment slightly shorter than the second, the third two-thirds and the fourth one-half the length of the second, the proximal segment with five or six setae and the second with seven or eight; maxilla with the proximal segment of the galea bearing three

setae on its mesal margin, maxillary palpus three segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spinelike projections at its ventro-distal margin and with two setae on each side of these spines, proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral margins extending almost as far cephalad as the mesal portion, lateral margins slightly carinate, primary setae large, prominent and slightly flattened, secondary setae small, not over ten in number (fig. 54).

Abdomen.—Chitinized areas distinct, secondary setae short, fine and not numerous (fig. 96); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with two setae; inner hooks with two setae, the spinelike projection slightly more than one-half the length of the hook (fig. 126).

Measurements.—Length of larva, 19 to 22 mm., width at the third abdominal segment, 1.8 to 2.2 mm.; diameter of ocellus 2, 0.26 to 0.28 mm.; distance between ocelli 1 and 2, 0.30 to 0.35 mm.; length of fronto-clypeo-labral area, 1.70 to 1.75 mm.; width, 1.80 to 1.85 mm.; length of pronotum, 2.1 to 2.3 mm.; width, 3.1 to 3.5 mm.

This species is very similar to *C. purpurea graminea*, but can be separated from it by the larger number of secondary setae on the pronotum, and the longer length of the spinelike projection of the inner hooks.

The adults appear from hibernation later in the spring than do those of *C. purpurea graminea* and the eggs are laid in June. By fall the larvae have reached the second instar, in which stage they pass the winter. They appear the latter part of the following May or the first of June, pass into the last larval instar, and pupate in July. Some of the adults emerge in August while others remain in the pupal chamber until the following spring. They reach sexual maturity in the spring about a month later than *C. purpurea graminea*. The larvae are found in clay on steep banks of Lake Michigan. The burrows enter at almost a right angle to the surface and curve into a nearly horizontal position at the inner end. They are from 7 to 10 centimeters deep and there is usually a chimney-like structure around the opening of the burrow which is formed by the soil excavated by the larva. Criddle (1910) states that the larvae are found at Atweme, Manitoba, in situations similar to those observed by Shelford, the depth of the burrow varying from 3 to 8 inches. The length of the larval stage is approximately 2 years and the adult stage from 9 to 11 months. In the vicinity of Chicago, Illinois, the larval stage lasts about 14 months and the adult stage 10 months.

CICINDELA PURPUREA GRAMINEA Schaupp.

Figs. 60, 97, and 127.

SHELFORD, reared, larvae in the collection of the University of Illinois.1908, **SHELFORD**, Journ. Linn. Soc. Lond., Zool., vol. 30, pp. 100-173.

Color.—Head and pronotum dark purplish bronze with a green reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect long, slightly flattened and prominent; diameter of ocellus 2 distinctly less than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on caudal part of frons bearing two setae; antenna with the proximal and second segments subequal in length, the third almost two-thirds, and the distal slightly more than one-half the length of the second, the proximal segment with six or seven setae and the second with eight or nine; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spine-like projections on its ventro-distal margin and with two setae on each side of these spines, proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephaled as the mesal portion, lateral margins slightly carinate, primary setae large, prominent and slightly flattened; secondary setae two in number, one cephalo-laterad of seta 5 (fig. 60).

Abdomen.—Chitinized areas distinct, secondary setae not numerous, fine and medium in length (fig. 97); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with two setae; inner hooks with two setae, the spine-like projection about one-third the length of the hook (fig. 127).

Measurements.—Length of larva, 19 to 22 mm., width at the third abdominal segment, 1.8 to 2.2 mm.; diameter of ocellus 2, 0.26 to 0.28 mm.; distance between ocelli 1 and 2, 0.33 to 0.35 mm.; length of fronto-clypeo-labral area, 1.75 to 1.85 mm., width, 1.75 to 1.85 mm.; length of pronotum, 2 to 2.3 mm., width 3 to 3.4 mm.

The adults appear from hibernation in April, mate and lay eggs the latter part of the month. The eggs are laid in moderately moist, black soil in openings in grassy places, such as cow paths in grassy ravines and old bare places near streams. They probably lay eggs only after rain on well drained soil. The larvae reach the third instar the latter part of August or the first of September, close their burrows and hibernate. The following spring they feed

until about the middle of June, pupate in July, and the adults emerge the latter part of August. These hibernate and become sexually mature the following April. There are two years between generations. The larvae studied were collected at Lyon, Illinois.

CICINDELA, species B.

(Possibly *C. CIMARRONA* LeConte or *OBSOLETA* Say.)

Figs. 62, 99, and 129.

SHELFORD, not reared, larvae in collection of the University of Illinois.

Color.—Head and pronotum dark purplish bronze with a strong green or blue reflection, lateral margins of pronotum slightly lighter in some specimens; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect medium in length, stout and prominent; diameter of ocellus 2 equal to the distance between ocelli 1 and 2; fronto-clypeo-labral area wider than long; U-shaped ridge on the caudal part of frons bearing two setae; antenna with the proximal segment as long as the second, the third two-thirds and the distal slightly less than one-half the length of the second, the proximal segment with 7 to 9 setae and the second with 9 to 11; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of the labial palpus with three spinelike projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal portion, the lateral margins slightly carinate, primary setae long and prominent, secondary setae minute, not more than 25 (fig. 62).

Abdomen.—Chitinized areas distinct, secondary setae almost as long as the primary setae, prominent and not numerous (fig. 99); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with two setae; inner hooks with two setae, the spinelike projection one-third the length of the hook (fig. 129).

The larvae were collected at Alamosa, Colorado, on the banks of the Rio Grande in dark, coarse sand and on level and sloping land which was always moist. The burrows were from 2 to 4 inches deep, usually sloping, the direction varying with the kind of soil.

CICINDELA LATESIGNATA LeConte.

Figs. 61, 98, and 128.

SHELFORD, not reared, larvae in collection of the University of Illinois.

Color.—Head and pronotum purplish bronze with a green reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect long and prominent; diameter of ocellus 2 equal to the distance between ocelli 1 and 2; fronto-clypeo-labral area slightly wider than long; U-shaped ridge on the caudal part of frons bearing two setae; antenna with the proximal segment slightly shorter than the second, the third two-thirds, and the distal one-half the length of the second, the proximal segment with five to seven setae and the second with ten to eleven; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at the ventro-distal end, proximal segment of labial palpus with three spinelike projections on its ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles not extending as far cephalad as the cephalo-mesal part, lateral margins carinate, primary setae medium in size and prominent, secondary setae about thirty in number, small (fig. 61).

Abdomen.—Chitinized areas distinct, secondary setae short, fine, and not numerous (fig. 98); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with three setae; inner hooks with two setae, the spinelike projection one-third the length of the hook (fig. 128).

Measurements.—Length of larvae, 18 to 22 mm.; width at the third abdominal segment, 2 to 2.3 mm.; diameter of ocellus 2, 0.26 to 0.28 mm.; distance between ocelli 1 and 2, 0.26 to 0.28 mm.; length of fronto-clypeo-labral area, 1.65 to 1.75 mm.; width, 1.75 to 1.85 mm.; length of pronotum, 2.9 to 3.2 mm.; width, 3 to 3.3 mm.

The identification of this larva is not positive. They were collected at La Jolla, California, on the beach in the tide flats just above high tide. The holes were from 1½ to 3 inches deep and frequently curved to a nearly horizontal position at the bottom. The soil consisted of mud or sand covered with mud.

CICINDELA, species C.

Figs. 151, 163, and 175.

SHELFORD, not reared, larvae in the collection of the University of Illinois and the author's collection.

Color.—Head and pronotum coppery bronze with a light blue reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect long and prominent; diameter of ocellus 2 equal to the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as wide; U-shaped ridge on caudal part of frons bearing two setae; antenna with the proximal segment slightly shorter than the second, the third two-thirds and the distal one-half the length of the second, the proximal segment with ten to twelve setae and the second with six to eight; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of the labial palpus with three spinelike projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral margins extending as far cephalad as the mesal portion, lateral margins slightly carinate, primary setae medium in size and prominent, secondary setae about 10 in number, moderate size (fig. 151).

Abdomen.—Chitinized areas distinct; secondary setae short, fine and not numerous (fig. 163); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with one seta; inner hooks with two setae, the spine-like projection one-third the length of the hook (fig. 175).

Measurements.—Length of larvae, 16 to 18 mm., width at the third abdominal segment, 2 to 2.5 mm.; diameter of ocellus 2, 0.30 to 0.32 mm.; distance between ocelli 1 and 2, 0.30 to 0.32 mm.; length of fronto-clypeo-labral area, 1.65 to 1.75 mm., width, 1.65 to 1.75 mm.; length of pronotum, 1.75 to 1.85 mm., width, 2.85 to 3 mm.

The larvae were collected at Pines, Indiana, by the author together with *Cicindela hirticollis*. They were also found with two undated collections of larvae of *Cicindela hirticollis*.

CICINDELA REPANDA Dejean.

Figs. 63, 100, and 130.

SHELFORD, reared, larvae in the collection of the University of Illinois, the U. S. National Museum and the author's collection.

1878, HORN, Trans. Amer. Ento. Soc., vol. 7, pp. 35-37, pl. 2, fig. 4a.

1908, SHELFORD, Journ. Linn. Soc. Lond., Zool., vol. 30, p. 170.

Color.—Head and pronotum dark coppery bronze with a light green reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect long, stout, and prominent; diameter of ocellus 2 equal to the distance between ocelli 1 and 2; fronto-clypeo-labral area wider than long; U-shaped ridge on caudal part of frons bearing two setae; antenna with the proximal and second segments sub-equal in length, the third three-fourths and the distal one-half the length of the second, the proximal segment with 9 or 10 setae and the second with 7 or 8; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spine-like projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal portion, lateral margins carinate, primary setae medium in size and prominent, secondary setae small and not numerous (fig. 63).

Abdomen.—Chitinized areas distinct, secondary setae very short, small and not numerous (fig. 100); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with one seta, if two are present one is much smaller than the other; inner hooks with two setae, the spine-like projection about one-sixth the length of the hook (fig. 130).

Measurements.—Length of larva, 16 to 18 mm., width at the third abdominal segment, 2 to 2.2 mm.; diameter of ocellus 2, 0.26 to 0.28 mm.; distance between ocelli 1 and 2, 0.26 to 0.28 mm.; length of fronto-clypeo-labral area, 1.50 to 1.60, width, 1.60 to 1.70 mm.; length of pronotum, 1.7 to 1.9 mm., width, 2.7 to 3 mm.

The larvae of this species are found in a greater variety of habitats than many of the other species of *Cicindela*. They have been collected from wet, sandy soil, wet muddy soil, moist clay, and soil with considerable humus. In general, however, they are found in

sandy situations around the margins of small ponds, lakes and streams which have too much vegetation for *Cicindela hirticollis*. The larvae usually occur among the first rather scattered vegetation in such places. The burrows are about ten centimeters deep and their general direction is at right angles to a sloping surface and oblique to a horizontal surface. The eggs are laid in May and June, and the larvae reach the third instar by fall, in which instar they pass the winter. The adults emerge the following summer, hibernate, and appear in May of the second year, reach sexual maturity, lay their eggs and die. They are two years in their life cycle.

CICINDELA LEPIDA Dejean.

Figs. 64, 101, and 131.

SHELFORD, reared, larvae in the collection of the University of Illinois, the U. S. National Museum, and the author's collection.

1908, SHELFORD, Journ. Linn. Soc. Lond., Zool., vol. 30., p. 172.

Color.—Head and pronotum bronze, with a greenish-blue reflection; setae on dorsal aspect of head and pronotum transparent or glassy, the other setae brown.

Head.—Setae on dorsal aspect long, slender and prominent; diameter of ocellus 2 distinctly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area slightly broader than long; U-shaped ridge on the caudal part of frons with two setae; antenna with the proximal segment subequal in length to the second, the third slightly more than one-half and the distal one-fourth the length of the second, the proximal segment with six or seven setae and the second with nine or ten; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at the ventro-distal end, proximal segment of labial palpus with two spine-like projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the mesal portion extending distinctly cephalad of the cephalo-lateral angles, lateral margins not carinate, primary setae not large or prominent, secondary setae small and numerous (fig. 64).

Abdomen.—Chitinized areas distinct, secondary setae about one-third the length of the primary setae, fine and not numerous (fig. 101); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with two setae; inner

hooks with two setae, the spine-like projection one-sixth the length of the hook (fig. 131).

Measurements.—Length of larva, 14 to 16 mm., width at the third abdominal segment, 2 to 2.2 mm.; diameter of ocellus 2, 0.32 to 0.34 mm.; distance between ocelli 1 and 2, 0.20 to 0.22 mm.; length of fronto-clypeo-labral area, 1.45 to 1.55 mm., width, 1.60 to 1.70 mm.; length of pronotum, 1.60 to 1.70 mm., width, 2.5 to 2.7 mm.

The life history of this species as given by Shelford (1908) for the northern part of Illinois differs from that of all others which he had observed, in that the larval stage lasts almost two years and the adult stage but a month or slightly more. The eggs are laid the latter part of July and the second instar is reached by autumn. They pass the winter in this instar, feed the next spring and summer and reach the third instar in June or July. They feed until late fall, hibernate, and come out about the first of the following May. The larvae pupate in June or July and the adults soon emerge, lay eggs and die. The species is two brooded, adults from each brood appearing in alternate years. As a result in May both second and third stage larvae can be secured, in July adults, eggs, first and third stage larvae, and in October second and third stage larvae. The following table gives the life history and the stages present for the three most important months of the year:

TABLE 1.
*The life history of Cicindela lepida.*¹

Brood No.	1st year			2d year		
	May	July.	October.	May.	July.	October.
I-----	3	A-E-1	2	2	3	3
II-----	2	3	3	3	A-E-1	2

¹ A=adult, E=egg, 1=1st instar, 2=2d instar, 3=3d instar.

Criddle (1910) states that the life history of *Cicindela lepida* is probably the same at Aweme, Manitoba, as at Chicago, Illinois; that is, the larval stage lasts approximately twenty-two months and the adult stage two months.

The eggs are laid and the larvae live in sand which is slightly shifting, in northern Illinois, usually near Lake Michigan, but in some cases on the tops of sand dunes one-half mile from the lake. The burrows are from 25 to about 40 inches deep in northern Illinois and from 58 to 72 inches deep at Aweme, Manitoba.

CICINDELA GRATIOSA Guérin.

Figs. 65, 102, and 132.

SHELFORD, reared, larvæ in the collection of the University of Illinois.

Color.—Head and pronotum dark purple with a blue reflection, setae on dorsal aspect of head and pronotum transparent or glassy, the other setae brown.

Head.—Setae on dorsal aspect long, slender and not conspicuous; diameter of ocellus 2 distinctly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on caudal part of frons bearing two setae; antenna with the proximal segment subequal in length to the second, the third slightly more than one-half and the distal one-fourth the length of the second, the proximal segment with seven or eight setae and the distal with 10 or 11; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spine-like projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the mesal portion extending distinctly cephalad of the cephalo-lateral angles, lateral margins carinate, primary setae small and inconspicuous, secondary setae minute and numerous (fig. 65).

Abdomen.—Chitinized areas on abdomen indistinct, secondary setae short, fine, and numerous (fig. 102); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with three setae; inner hooks with two setae; the spinelike projection about one-sixth the length of the hook (fig. 132).

Measurements.—Length of larvæ, 17 to 19 mm., width at the third abdominal segment, 2 to 2.3 mm.; diameter of ocellus 2, 0.30 to 0.33 mm.; distance between ocelli 1 and 2, 0.17 to 0.18 mm.; length of fronto-clypeo-labral area, 1.35 to 1.40 mm.; width, 1.35 to 1.40 mm.; length of pronotum, 1.5 to 1.7 mm.; width, 2.3 to 2.5 mm.

The larvæ of this species were collected at Mobile, Ala., in a sandy, dry stream bed and other sandy situations. The soil was sandy and had sufficient clay in it to make it mold well. The larval burrows were vertical and from 22 to 44 inches deep.

CICINDELA, species D.

Figs. 152, 164, and 178.

HAMILTON, not reared, larvæ in collection of the author.

Color.—Head and pronotum purplish brown to bronze with a light bluish purple reflection, lateral margins lighter; setae on dorsal

aspect of head and pronotum white or transparent, the other setae brown.

Head.—Setae on dorsal aspect medium length, prominent; diameter of ocellus 2 equal to the distance between ocelli 1 and 2; fronto-clypeo-labral area almost as long as broad; U-shaped ridge on the caudal part of frons bearing two setae; antenna with the proximal segment slightly shorter than the second, the third a little more than two-thirds and the distal one-third the length of the second, the proximal segment with 5 or 6 setae and the second with 9 or 10; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae not arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spine-like projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal portion, lateral margins slightly carinate, primary setae medium size, prominent, secondary setae medium size and few in number (fig. 152).

Abdomen.—Chitinized areas not distinct, secondary setae short and not numerous (fig. 164); ninth abdominal sternum with the caudal margin bearing two groups of five setae each; median hooks with three or four setae; inner hooks with two setae, the inner seta located nearer the base of the hook than the outer one, the spinelike projection one-half the length of the hook (fig. 178).

Measurements.—Length of larvae, 25 to 27 mm., width at the third abdominal segment, 3.5 to 4 mm.; diameter of ocellus 2, 0.37 to 0.38 mm.; distance between ocelli 1 and 2, 0.37 to 0.38 mm.; length of fronto-clypeo-labral area, 2.3 to 2.4 mm., width, 2.4 to 2.6 mm.; length of pronotum, 2.9 to 3.1 mm., width, 4.6 to 4.9 mm.

The larvae of this species may be distinguished from the preceding by the longer spinelike projection of the inner hook and the inner seta on the hook being located nearer the base than the outer seta, also by the less numerous secondary setae on the pronotum and its distinctly larger head measurements.

The larvae were collected at Haswell, Colorado, on the open prairie in clay or adobe soil. The burrows occurred between bunches of grass, were about 8 inches deep, slightly spiral, and two-fifths of an inch in diameter at the bottom. Smaller larvae collected in the same situation and which appeared to be immature larvae of this species had a chimney-like structure about an inch long around the opening of the burrow. This addition was about an inch long and was built so that it was parallel to the surface of the ground.

CICINDELA TRANQUEBARICA Herbst.

Figs. 66, 103, and 133.

SHELFORD, reared, larvae in the collection of the University of Illinois, the U. S. National Museum, and the author's collection.
1908, SHELFORD, Journ. Linn. Soc. Lond., Zool., vol. 30, p. 172.

Color.—Head and pronotum dark purple or purplish bronze with a strong green reflection; setae on the dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on the dorsal aspect medium in length and prominent; diameter of ocellus 2 slightly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area slightly wider than long; U-shaped ridge on caudal part of frons bearing two setae; antenna with the proximal and second segments subequal in length, the third two-thirds and the distal one-half the length of the second, the proximal segment with 7 or 8 setae and the second with 9 or 10; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spinelike projections at the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal portion, the lateral margins slightly carinate, primary setae large and prominent, secondary setae small and not over 25 in number (fig. 66).

Abdomen.—Chitinized areas distinct, secondary setae from one-half to almost as long as the primary setae, prominent and not numerous (fig. 103); ninth abdominal sternum with the caudal margin bearing 2 groups of 4 setae each; median hooks with 3 setae; inner hooks with 2 setae, the spinelike projection one-third the length of the hook (fig. 133).

Measurements.—Length of larvae, 21 to 24 mm., width at the third abdominal segment, 2.4 to 2.8 mm.; diameter of ocellus 2, 0.29 to 0.31 mm.; distance between ocelli 1 and 2, 0.26 to 0.27 mm.; length of fronto-clypeo-labral area, 1.80 to 1.90 mm., width, 1.90 to 2 mm.; length of pronotum, 2.1 to 2.3 mm., width, 3.3 to 3.8 mm.

The life history of this species is essentially the same as that of *Cicindela purpurea graminea*. The eggs are laid in a variety of moist situations but are more often laid in sandy soil with some humus and in among some vegetation. The burrows are straight and from 9 to 20 inches deep. At Brandon, Manitoba, the larvae were found at a uniform depth of about 18 to 20 inches and were usually dug from sandy soil. Criddle (1910) says:

Two distinct sizes were found among the larvae in autumn, which corresponded to the first and second year of *venusta*, so that it seems highly probable that the larval life lasts two years, while that of the adult continues for about eleven months.

CICINDELA SILVICOLA Latreille.

Figs. 159, 170, and 180.

REITTER, E., two larvae in the collection of the U. S. National Museum.
Bought from and determined by Reitter, 1922.

Color.—Head and pronotum brownish bronze with a purple reflection, lateral margins of pronotum slightly lighter; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect long and conspicuous; diameter of ocellus 2 slightly less than the distance between ocelli 1 and 2; fronto-clypeo-labral area slightly wider than long; U-shaped ridge on caudal part of frons bearing two prominent setae; antenna with the proximal and second segments subequal in length, the third three-fourths and the fourth one-half the length of the second, the proximal segment with 5 to 7 setae and the second with 9 or 10; maxilla with the proximal segment of the galea bearing 3 setae on its mesal margin, maxillary palpus three-segmented; ligula with 4 fine setae on its ventro-distal end arranged in a transverse row, proximal segment of the labial palpus with 3 spinelike projections on the ventro distal margin and with 2 setae on each side of these spines, the proximal segment with 4 setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending as far cephalad as the cephalo-mesal portion, lateral margins slightly carinate; primary setae long and prominent, secondary setae absent except for a single prominent one on each cephalo-lateral part of the pronotum (fig. 159).

Abdomen.—Chitinized areas distinct; secondary setae few, short, and not conspicuous (fig. 170); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with three or four setae; inner hooks normally with two but sometimes three setae, the spinelike projection one-half the length of the hook (fig. 180).

Measurements.—Length of larvae, 18 to 20 mm.; width at the third abdominal segment, 2 to 2.5 mm.; diameter of ocellus, 2, 0.30 to 0.32 mm.; distance between ocelli 1 and 2, 0.40 to 0.42 mm.; length of fronto-clypeo-labral area, 2.7 mm.; width, 2.7 mm.; length of pronotum, 2.5 mm.; width, 4.4 mm.

Remarks.—This is an European species, the larvae of which were purchased from E. Reitter, Paskau, by the U. S. National Museum. No data accompanied the material.

CICINDELA OREGONA LeConte.

Figs. 67, 104, and 134.

SHELFORD, not reared, larvae in the collection of the University of Illinois, U. S. National Museum, and the author's collection.

Color.—Head and pronotum dark coppery bronze with a strong blue reflection, lateral margins of pronotum lighter in some specimens; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect slender, of medium length and not conspicuous; diameter of ocellus 2 equal to the distance between ocelli 1 and 2; fronto-clypeo-labral area slightly wider than long; U-shaped ridge on caudal part of frons bearing two setae; antenna with the proximal segment slightly shorter than the second, the third two-thirds and the distal one-half the length of the second, the proximal segment with nine to eleven setae and the second with nine to eleven setae; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spinelike projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal portion, lateral margins carinate, primary setae not large or prominent, secondary setae short, about 25 to 30 in number and with a row on each side of the meson (fig. 67).

Abdomen.—Chitinized areas distinct, secondary setae about one-fourth the length of the primary setae, fine and not numerous (fig. 104); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with three setae; inner hooks with two setae, the spinelike projection about one-third the length of the hook (fig. 134).

Measurements.—Length of larvae, 19 to 22 mm., width at the third abdominal segment, 2.3 to 2.5 mm.; diameter of ocellus 2, 0.26 to 0.28 mm.; distance between ocelli 1 and 2, 0.26 to 0.28 mm.; length of fronto-clypeo-labral area, 1.60 to 1.70 mm., width, 1.70 to 1.80 mm.; length of pronotum, 1.80 to 2 mm., width, 3 to 3.3 mm.

The larvae of this species are similar to *Cicindela 12-guttata*, but can be distinguished from them by the larger number of setae on the pronotum and the blue reflection, which is much stronger. The larvae were collected at Albuquerque, New Mexico, and Hagerman, Idaho, in moist clay soil with some humus, at an elevation of 6,000 to

7,500 feet. The holes were about 5 inches in depth and entered on a steep, sloping bank and curved to a vertical position at the bottom. Dr. F. E. Blaisdell, sr., reports collecting the larvae from California in sand. The larvae studied were not from reared material, however, their peculiar location and the collection of adults at these places would indicate that the identification is correct.

CICINDELA DUODECIMGUTTATA Dejean.

Figs. 68, 105, and 185.

SHELFORD, reared, larvae in the collection of the University of Illinois and the U. S. National Museum.

1908, SHELFORD, Journ. Linn. Soc. Lond., Zool., vol. 30, pp. 172-173.

Color.—Head and pronotum coppery bronze with a green reflection, lateral margins of pronotum slightly lighter in some specimens, setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect long, stout, and prominent; diameter of ocellus 2 slightly less than the distance between ocelli 1 and 2; fronto-cylpeo-labral area wider than long; U-shaped ridge on caudal part of frons bearing two setae; antenna with the proximal segment slightly shorter than the second, the third two-thirds and the distal one-half the length of the second, the proximal segment with 9 to 11 setae and the second segment with 9 to 11 setae; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spinelike projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending as far cephalad as the mesal portion, lateral margins slightly carinate, primary setae medium in size and prominent, secondary setae minute, not more than 10 in number, and not with a row on each side of the meson (fig. 68).

Abdomen.—Chitinized areas distinct, secondary setae about one-third the length of the primary setae, fine and not numerous (fig. 105); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with three setae; inner hooks with two setae, the spinelike projection one-third the length of the hook (fig. 135).

Measurements.—Length of larvae, 18 to 20 mm., width at the third abdominal segment, 2.2 to 2.4 mm.; diameter of ocellus 2, 0.26 to 0.28 mm.; distance between ocelli 1 and 2, 0.28 to 0.30 mm.; length

of fronto-clypeo-labral area, 1.60 to 1.70 mm., width, 1.70 to 1.80 mm.; length of pronotum, 1.90 to 2.10 mm., width, 3 to 3.3 mm.

The life history of this species has not been definitely determined, but field observations would seem to indicate that it is similar to *Cicindela repanda*. The larvae are usually found in clay or humus. Criddle (1907) found the larvae burrowing in large numbers along the banks of a river at Awene, Manitoba, in clayey, muddy, and sandy soil. In the summer time the burrows are from 4 to 5 inches deep and in the winter time from 6 to 15 inches. The holes generally slant obliquely into the bank.

CICINDELA GERMANICA Linnaeus.

Figs. 160, 171, and 181.

REITTER, E., two larvae in the collection of the U. S. National Museum.
Bought from and determined by E. Reitter, 1922.

Color.—Head and pronotum brownish bronze with a faint green reflection; setae on dorsal aspect of head and pronotum transparent, the other setae brown.

Head.—Setae on dorsal aspect short, fine, and inconspicuous; diameter of ocellus 2 subequal to the distance between ocelli 1 and 2; fronto-clypeo-labral area subequal in length and width; U-shaped ridge on caudal part of frons, bearing two fine inconspicuous setae; antenna with the proximal and second segments subequal in length, the third three-fourths and the fourth slightly more than one-half the length of the second, the proximal and second segments each with five or six setae; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae on the ventro-distal end arranged in a transverse row, proximal segment of labial palpus with three spinelike projections on the ventro-distal end and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the cephalo-mesal portion, lateral margins slightly carinate; primary setae not large or prominent; secondary setae short, few and inconspicuous (fig. 160).

Abdomen.—Chitinized areas indistinct; secondary setae few, fine, and inconspicuous (fig. 171); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with three setae; inner hooks with two setae, the setae on the outer side of the hook nearer the tip than the one on the inner side, spine-like projection about one-third the length of the hook (fig. 181).

Measurements.—Length of larvae, 15 to 17 mm.; width at the third abdominal segment, 1.5 to 2 mm.; diameter of ocellus 2, 0.18 to

0.20 mm.; distance between ocelli 1 and 2, 0.18 to 0.20 mm.; length of fronto-clypeo-labral area, 1.1 to 1.2 mm.; width, 1.1 to 1.2 mm.; length of pronotum, 1.3 to 1.4 mm.; width, 2.4 to 2.5 mm.

Remarks.—This is a European species, the larvae of which were purchased from E. Reitter, Paskau, by the United States National Museum. No data accompanied the material.

CICINDELA PUNCTULATA Olivier.

Figs. 69, 106, and 136.

SHELFORD, reared, larvae in the collection of the University of Illinois and the author's collection.

1908, SHELFORD, Journ. Linn. Soc. Lond., Zool., vol. 30, p. 172.

Color.—Head and pronotum purplish bronze with a faint blue reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect medium in length and prominent; diameter of ocellus 2 slightly less than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on caudal part of frons bearing two setae; antenna with the proximal and second segments subequal in length, the third slightly shorter than the second and the distal about one-half as long as the second, the proximal segment with five or six setae and the second with nine or ten; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae at the ventro-distal end arranged in a transverse row, proximal segment of labial palpus with three spinelike projections on the ventro-distal margin and with two setae on each side of these spines, proximal segment bearing four setae and the distal segment one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal portion, lateral margins slightly carinate, primary setae 5 and 6 small, secondary setae small and not numerous (fig. 69).

Abdomen.—Chitinized areas indistinct, secondary setae not numerous and about one-half the length of the primary setae (fig. 106); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with three setae, inner hooks with two setae, the spinelike projection about one-third the length of the hook (fig. 136).

Measurements.—Length of larvae, 14 to 16 mm., width at the third abdominal segment, 1.8 to 2 mm.; diameter of ocellus 2, 0.20 to 0.23 mm.; distance between ocelli 1 and 2, 0.23 to 0.25 mm.; length of fronto-clypeo-labral area, 1.4 to 1.5 mm., width, 1.3 to 1.4 mm.; length of pronotum, 1.5 to 1.7 mm., width, 2.3 to 2.7 mm.

The life history of this species as given by Shelford (1908) differs from that of other species in that the adults do not hibernate and there is only a single year required for the life cycle. The eggs are laid in relatively hard, dry soil, usually humus, the latter part of July, and larvae were dug from bare spaces between clumps of grass in the vacant lots of Chicago. The majority of the larvae are in the third instar by September, in which instar they hibernate and appear early the next spring. They feed until April or early June, when they pupate. The adults emerge in early July, mate and lay eggs. The larval burrows during the feeding season are from 12 to 16 inches deep but are slightly shallower in the summer just before the larvae go into the pupal stage. This species was reared by Shelford, 1905 and 1906 at Chicago, Illinois. Criddle (1907) states that the larvae are found at Aweme, Manitoba, in small, mossy places between clumps of grass in dry situations. The depth of the holes ranged from 18 to 26 inches. The adults do not hibernate and it is probable that the larval stage lasts over two winters.

I have collected adults and dug larvae of this species from moist, adobe soil at Haswell, Colorado.

CICINDELA FLAVOPUNCTATA RECTILATERA Chaudoir.

Figs. 70, 107, and 137.

SHELFORD, reared, larvae in the collection of the University of Illinois.

Color.—Head and pronotum purple or purplish bronze with a blue reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect long and prominent; diameter of ocellus 2 greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on the caudal part of frons bearing two setae; antenna with the proximal segment slightly shorter than the second, the third one-half and the fourth a little more than one-third the length of the second, the proximal segment with five or six setae and the second with nine or ten; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spine-like projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending as far cephalad as the mesal portion, lateral margins carinate, primary setae large and prominent, secondary setae small and not numerous (fig. 70).

Abdomen.—Chitinized areas distinct, secondary setae almost as long as the primary setae, fine and not numerous (fig. 107); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with three setae; inner hooks with two setae, the spine-like projection one-third the length of the hook (fig. 137).

Measurements.—Length of larvae, 17 to 19 mm.; width at the third abdominal segment, 2 to 2.3 mm.; diameter of ocellus 2, 0.26 to 0.27 mm.; distance between ocelli 1 and 2, 0.23 to 0.25 mm.; length of fronto-clypeo-labral area, 1.25 to 1.35 mm.; width, 1.25 to 1.35 mm.; length of pronotum, 1.7 to 1.8 mm.; width, 2.7 to 2.9 mm.

The larvae were collected at Houston, Texas, in heavy, clayey soil. The holes were about 4 inches long and curved almost to a horizontal position at the bottom.

CICINDELA UNIPUNCTATA Fabricius.

Figs. 71, 108, and 138.

SHELFORD, not reared, larvae in the collection of the University of Illinois.

Color.—Head and pronotum a purplish bronze with a green reflection; setae on dorsal aspect of head and pronotum transparent or glassy, the other setae brown.

Head.—Setae on dorsal aspect long, stout, and prominent; diameter of ocellus 2 slightly less than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on caudal part of frons bearing two setae; antenna with the proximal segment as long as the second, the third two-thirds, and the distal one-half the length of the second, the proximal segment with seven or eight setae and the second with seven or eight; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end; proximal segment of labial palpus with three spine-like projections on the ventro-distal margin and with two setae on each side of these spines, proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending distinctly cephalad of the mesal portion, lateral margin carinate, primary setae not large or conspicuous, secondary setae wanting or very minute (fig. 71).

Abdomen.—Chitinized areas distinct, secondary setae not numerous, and from short to more than one-half the length of the primary setae (fig. 108); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with three setae; inner hooks with five or six setae, the spine-like projection about one-third the length of the hook (fig. 138).

Measurements.—Length of larvae, 22 to 25 mm.; width at the third abdominal segment, 3 to 3.3 mm.; diameter of ocellus 2, 0.28 to 0.30 mm.; distance between ocelli 1 and 2, 0.31 to 0.33 mm.; length of fronto-clypeo-labral area, 1.9 to 2 mm.; width, 1.9 to 2 mm.; length of pronotum, 2.1 to 2.3 mm.; width, 3.6 to 3.8 mm.

This species is easily separated from all others by the position of the cephalo-lateral angles of the pronotum, which extend distinctly cephalad of the mesal portion. The larvae were dug at Lafollette, Tennessee, from bare, rocky soil on a steep, sparsely wooded hillside. Recent burning had probably removed the leaves which normally covered the slope. The burrows were perpendicular for the first 3 or 4 inches and then curved to a horizontal position. The larvae were not bred, but all other species of the region have been.

CICINDELA ABDOMINALIS Fabricius.

Figs. 72, 109, and 139.

MANEE, not reared, larvae in the collection of the University of Illinois.

Color.—Head and pronotum purplish bronze with a green or blue reflection; setae on dorsal aspect of head and pronotum transparent or glassy, the other setae brown.

Head.—Setae on dorsal aspect long, slender, and not prominent; diameter of ocellus 2 distinctly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on the caudal part of frons bearing two setae; antenna with the proximal segment slightly shorter than the second, the third one-half and the distal one-fourth the length of the second, the proximal segment with seven or eight setae and the second with ten to twelve; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae not arranged in a transverse row at its ventro-distal end, the two median setae caudad of the lateral ones; proximal segment of the labial palpus with three spine-like projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the mesal portion extending distinctly cephalad of the cephalo-lateral angles, lateral margins slightly carinate, primary setae long, slender, and inconspicuous, secondary setae short and fairly numerous (fig. 72).

Abdomen.—Chitinized areas indistinct, secondary setae short, fine, and numerous and occurring between as well as upon the chitinized areas (fig. 109); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with three

setae; inner hooks with three setae, the spine-like projection inconspicuous or wanting (fig. 139).

Measurements.—Length of larvae, 18 to 20 mm., width at the third abdominal segment, 2 to 2.3 mm.; diameter of ocellus 2, 0.29 to 0.31 mm.; distance between ocelli 1 and 2, 0.19 to 0.21 mm.; length of fronto-clypeo-labral area, 1.65 to 1.75 mm.; width, 1.65 to 1.75 mm.; length of pronotum, 1.9 to 2.1 mm., width, 2.3 to 2.5 mm.

The larvae were collected at Southern Pines, North Carolina, by Mr. A. H. Manee in hard soil at the side of a road. The burrows were small and about 25 inches deep. The larvae were not reared and the identification is not positive.

CICINDELA MARGINATA Fabricius.

Figs. 73, 110, and 140.

SHELFORD, reared, larvae in the collection of the University of Illinois.

Color.—Head and pronotum dark purplish bronze with a strong blue reflection; setae on dorsal aspect of head and pronotum transparent or glassy, the other setae brown.

Head.—Setae on dorsal aspect long, slender, and inconspicuous; diameter of ocellus 2 distinctly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on caudal part of frons bearing two setae; antenna with the proximal segment subequal in length to the second; the third two-thirds and the distal slightly less than one-half the length of the second, the proximal segment with nine or ten setae and the second segment with nine or ten; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end; proximal segment of the labial palpus with three spine-like projections on the ventro-distal end and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles not extending as far cephalad as the mesal portion; lateral margins slightly carinate, primary setae not large or conspicuous, secondary setae small and not numerous (fig. 73).

Abdomen.—Chitinized areas distinct, secondary setae short, fine, and numerous (fig. 110); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with three setae; inner hooks with nine or ten setae, the spine-like projection almost obsolete (fig. 140).

Measurements.—Length of larvae, 19 to 22 mm., width at the third abdominal segment, 2.2 to 2.4 mm.; diameter of ocellus 2, 0.33 to 0.35 mm.; distance between ocelli 1 and 2, 0.28 to 0.30 mm.;

length of fronto-clypeo-labral area, 1.55 to 1.65 mm., width, 1.55 to 1.65 mm.; length of pronotum, 1.7 to 1.9 mm., width, 2.8 to 3 mm.

This species is easily distinguished by the large number of setae on the inner hooks. The larvae were collected at Galveston, Texas, on Denver Beach, a short distance back from the shore line in sandy soil with scattered vegetation, the larvae occurring in the open places. The holes were from 9 to 10 inches deep.

CICINDELA FORMOSA Say.

Figs. 74, 111, and 141.

SHELFORD, not reared, larvae in the collection of the University of Illinois.

Color.—Head and pronotum chestnut brown with a color pattern of lighter areas; setae on dorsal aspect of head and pronotum transparent to white, the other setae brown.

Head.—Setae on dorsal aspect long, stout, and prominent; diameter of ocellus 2 distinctly less than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on caudal part of frons bearing three setae; antenna with the proximal segment slightly shorter than the second, the third one-half and the distal one-fourth the length of the second, the proximal segment with five or six setae and the second with nine or ten; maxilla with the proximal segment of the galea bearing four setae on the mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at the ventro-distal end, proximal segment of labial palpus with two spine-like projections on the ventro-distal margin and with three setae on the mesal side and two on the lateral side of these spines, the proximal segment with five setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal portion, lateral margins carinate, primary setae not large or prominent, setae 5 and 6 wanting, secondary setae wanting (fig. 74).

Abdomen.—Chitinized areas distinct, secondary setae about one-half the length of the primary setae, fine and not numerous (fig. 111); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with two setae; inner hooks with four setae, the spinelike projection one-third the length of the hook (fig. 141).

Measurements.—Length of the larvae, 24 to 26 mm., width at the third abdominal segment, 3.4 to 3.6 mm.; diameter of ocellus 2, 0.33 to 0.34 mm.; distance between ocelli 1 and 2, 0.39 to 0.40 mm.; length of fronto-clypeo-labral area, 2.5 to 2.6 mm., width, 2.5 to 2.6 mm.; length of pronotum, 2.9 to 3 mm., width 4.2 to 4.5 mm.

Larvae were collected at Salida, Colorado, in a sand dune near water along the Arkansas River and from Benkelman, Nebraska, on the south fork of the Republican River in the crest of sand dunes. At Salida, Colorado, the sand was coarse and fine mixed and had probably been deposited by high water. The holes were vertical and about 22 inches deep. The burrows have a pit similar to those of *Cicindela formosa generosa* found around Chicago, Illinois, and Pines, Indiana.

CICINDELA FORMOSA GENEROSA Dejean.

Figs. 49, 50, 51, 88, 89, 90, and 142.

SHELFORD, reared, larvae in the collection of the University of Illinois, the U. S. National Museum, and the author's collection.

1908, SHELFORD, Journ. Linn. Soc. Lond., Zool., vol. 30, p. 172.

Color.—Head and pronotum chestnut brown with a color pattern of lighter areas; setae on dorsal aspect of head and pronotum transparent to white, the other setae brown.

Head.—Setae on dorsal aspect long, stout, and prominent; diameter of ocellus 2 distinctly less than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on caudal part of frons bearing three setae; antenna with the proximal segment slightly shorter than the second, the third one-half and the distal one-third the length of the second, the proximal segment with six or seven setae and the second, with nine or ten; maxilla with the proximal segment of the galea bearing four setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with two spinelike projections on the ventro-distal margin and with three setae on the mesal and two on the lateral side of these spines, the proximal segment with five setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles not extending as far cephalad as the mesal portion, the lateral margins slightly carinate, primary setae not large and prominent, seta 6 wanting, secondary setae wanting (fig. 51).

Abdomen.—Chitinized areas distinct, secondary setae almost as long as the primary setae, slender and numerous (fig. 90); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with three setae; inner hooks with four setae, the spinelike projection one-third the length of the hook (fig. 142).

Measurements.—Length of larvae, 22 to 24 mm.; width at the third abdominal segment, 3 to 3.3 mm.; diameter of ocellus 2, 0.30 to 0.32 mm.; distance between ocelli 1 and 2, 0.37 to 0.40 mm.; length

of fronto-clypeo-labral area, 2.2 to 2.4 mm., width, 2.2 to 2.4 mm.; length of pronotum, 2.4 to 2.7 mm.; width, 3.6 to 4.2 mm.

The larvae of this species are similar to those of *Cincindela formosa* but can be distinguished from them by the smaller average width of the pronotum, the lack of a color pattern on the pronotum and the presence of three setae on the median hooks.

The adults emerge from hibernation in April or May and lay eggs in May or June in sandy soil which is slightly shifting. The eggs hatch in June and the larvae reach the third instar by the latter part of August or the first of September. They close their burrows the latter part of September or the first of October and go into hibernation, appearing again in the spring. Pupation takes place in June or July and some of the adults emerge from the pupal chamber during the summer while the remainder stay in the pupal chamber until the following spring. The adults appear in April or May, become sexually mature in about a month, lay eggs, and die.

The larvae of this species are very noticeable because of their peculiar burrows. The main part of the burrow is from 12 to 20 inches deep and vertical throughout the greater part of its course. About two-thirds of an inch from the top the burrow curves sharply to a horizontal position and opens into a small pit. This construction serves to keep the sand, which is always slightly shifting, from filling up the burrow and also serves as a trap for catching insects. The larva cements the sand immediately around the opening with saliva which keeps it from caving in. The pupal chamber is an oblique side cavity about 4 inches below the surface. The upper part and much of the lower part of the burrow is filled with sand which is taken from the cavity.

Larvae were collected along the sand dunes of Lake Michigan, near Chicago, on the leeward side of the first ridge where the bunch grass has come in and the cottonwoods are old with occasional seedlings of pine. They reach their greatest abundance among the young pines but rarely invade the denser growths.

CINCINDELA SCUTELLARIS LECONTEI Haldeman.

Figs. 75, 112, and 143.

SHELFORD, reared, larvae in the collection of the University of Illinois, the U. S. National Museum and the author's collection.

1908, SHELFORD, Journ. Linn. Soc. Lond., Zool., vol. 30, p. 172.

Color.—Head and pronotum purplish bronze with a green reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect long, stout, and prominent; diameter of ocellus 2 equal to the distance between ocelli 1 and 2;

fronto-clypeo-labral area as long as broad; U-shaped ridge on caudal part of frons bearing three setae; antenna with the proximal segment subequal in length to the second, the third two-thirds and the distal one-half the length of the second, the proximal segment with five or six setae and the second with ten to twelve; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at the ventro-distal end, proximal segment of labial palpus with three spine-like projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal portion, lateral margins carinate, primary setae large and prominent, secondary setae small, not more than fifty in number, and with a row on each side of the meson (fig. 75).

Abdomen.—Chitinized areas distinct, most of the secondary setae short, fine, and numerous (fig. 112); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with three setae; inner hooks usually with four setae but occasionally with three, the spine-like projection one-third the length of the hook (143).

Measurements.—Length of larvae, 20 to 24 mm., width at the third abdominal segment, 2.4 to 2.8 mm.; diameter of ocellus 2, 0.27 to 0.30 mm.; distance between ocelli 1 and 2, 0.27 to 0.30 mm.; length of fronto-clypeo-labral area, 1.7 to 1.8 mm., width, 1.7 to 1.8 mm.; length of pronotum, 1.7 to 2 mm., width, 2.8 to 3.2 mm.

The life history of this species is similar to that of *Cicindela purpurea graminea*. The adults appear later in the spring and remain later in the summer. The eggs are laid and the larvae found in dry sand which contains some humus. Along Lake Michigan, near Chicago, the larvae were found further back than those of *Cicindela formosa generosa*. They were found in the greatest abundance where the oaks begin to displace the pines.

CICINDELA CUPRASCENS MACRA LeConte.

Figs. 153, 165, and 172.

SHELFORD, first and second stages reared, third stage not reared, larvae in the collection of the University of Illinois.

Color.—Head and pronotum bright bronze with a faint green and purple reflection, lateral margins of pronotum light yellow;

setae on dorsal aspect of head and pronotum white, the other setae transparent or brown.

Head.—Setae on dorsal aspect medium length, stout, and conspicuous; diameter of ocellus 2 slightly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area slightly wider than long; U-shaped ridge on caudal part of frons bearing three setae; antenna with the proximal and second segments subequal in length, the third two-thirds, and the fourth slightly less than one-half the length of the second, the proximal segment with seven or eight setae and the second with nine or ten; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with three spinelike projections on its ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending as far cephalad as the mesal portion, lateral margins slightly carinate, primary setae medium size, prominent; secondary setae not more than 20 in number, not prominent (fig. 153).

Abdomen.—Chitinized areas not distinct, secondary setae about as numerous as primary setae and one-third to one-half as long (fig. 165); ninth abdominal sternum with the caudal margin bearing two groups of 4 setae each; median hooks with 3 and sometimes 4 setae; inner hooks with 2 setae, the spinelike projections slightly less than one-half the length of the hook (fig. 172).

Measurements.—Length of larvae, 18 to 20 mm., width at the third abdominal segment, 2 to 2.5 mm.; diameter of ocellus 2, 0.36 to 0.37 mm., distance between ocelli 1 and 2, 0.35 to 0.36 mm.; length of fronto-clypeo-labral area, 2.07 mm.; width, 2.15 mm.; length of pronotum, 2.5 mm., width, 4.1 mm.

The full-grown larvae used in this description were not reared but were taken from collections of *Cicindela hirticollis*. The first and second stages had been reared by Shelford and comparisons of these with the dug larvae permits of little, if any, doubt that the identification is correct. Shelford states that in the terrigenous margin of Lake Michigan the adults of *Cicindela cuprascens* are found associated with those of *Cicindela hirticollis*. They frequent the moist clean sand with little or no humus. He was never able to find the larvae, due perhaps to the fact that these larvae do not smooth the edges of their holes. The burrows of the reared first and second stages and the ones collected by the author are shallow and similar to those of *Cicindela hirticollis*.

CICINDELA PULCHRA Say.

Figs. 76, 113, and 144.

SHELFORD, not reared, larvae in the collection of the University of Illinois.

Color.—Head and pronotum dark purple with a dark green reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect long, stout and prominent; diameter of ocellus 2 greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on caudal part of frons bearing 3 setae; antenna with the proximal segment slightly shorter than the second, the third one-half and the distal slightly more than one-third the length of the second, the proximal segment with 5 or 6 setae and the second with 9 or 10; maxilla with the proximal segment of the galea bearing 3 setae on its mesal margin, maxillary palpus three-segmented; ligula with 4 fine setae arranged in a transverse row at the ventro-distal end, proximal segment of labial palpus with 3 spine-like projections on the ventro-distal margin and with 2 setae on each side of these spines, the proximal segment with 4 setae and the distal segment with 1.

Thorax.—Pronotum with the cephalo-lateral angles extending as far cephalad as the mesal portion, lateral margins slightly carinate, primary setae not large or prominent, secondary setae small and not over fifteen in number (fig. 76.)

Abdomen.—Chitinized areas distinct, secondary setae short, small and not numerous (fig. 113); ninth abdominal sternum with the caudal margin bearing 2 groups of 4 setae each; median hooks with 2 setae; inner hooks with 2 setae, the spinelike projection one-half the length of the hook (fig. 144).

Measurements.—Length of larvae, 21 to 23 mm., width at the third abdominal segment, 3 to 3.4 mm.; diameter of ocellus 2, 0.33 to 0.37 mm.; distance between ocelli 1 and 2, 0.30 to 0.32 mm.; length of fronto-clypeo-labral area, 1.9 to 2.1 mm., width, 1.9 to 2.1 mm.; length of pronotum, 2.3 to 2.5 mm., width, 3.7 to 4 mm.

The larvae were collected at Albuquerque, New Mexico, near the upper end of an arroya in moist, adobe soil. The holes were vertical and from 4 to 8 inches deep.

CICINDELA OBSOLETA Say.

Figs. 158, 169, and 179.

HAMILTON, not reared, larvae deposited in the U. S. National Museum and the author's collection.

Color.—Head and pronotum a dark purple with a bluish green reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect long, stout, and prominent; diameter of ocellus 2 greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on caudal part of frons bearing 3 setae; antenna with the proximal segment slightly shorter than the second, the third two-thirds and the distal slightly less than one-half the length of the second, the proximal segment with 5 or 6 setae and the second with 9 or 10; maxilla with the proximal segment of the galea bearing 3 setae on its mesal margin, maxillary palpus three-segmented; ligula with 4 fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with 3 spinelike projections on the ventro-distal margin and with 2 setae on each side of these spines, the proximal segment with 4 setae and the distal segment with 1.

Thorax.—Pronotum with the cephalo-lateral angles not extending as far cephalad as the mesal portion, lateral margins carinate, primary setae not large or distinct, secondary setae small, inconspicuous and not over 15 in number (fig. 158).

Abdomen.—Chitinized areas distinct; secondary setae short, small and not numerous (fig. 169); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with two setae; inner hooks with two setae, the spinelike projection one-half or more the length of the hook (fig. 179).

Measurements.—Length of larvae, 23 to 27 mm.; width at the third abdominal segment, 3 to 4 mm.; diameter of ocellus 2, 0.37 to 0.39 mm.; distance between ocelli 1 and 2, 0.30 to 0.32 mm.; length of fronto-clypeo-labral area, 2.1 to 2.2 mm., width, 2.1 to 2.2 mm.; length of pronotum, 2.7 to 2.8 mm., width, 4.3 to 4.5 mm.

This species is very similar to *Cicindela pulchra* and differs from it principally in the slightly larger size as is shown by the head measurements, the cephalo-lateral angles not extending as far cephalad as the mesal portion, a slightly different arrangement of the setae on the third abdominal segment and the form of the mesal hooks.

Larvae were not reared and the determination given is not final. It is possible that the species here described may be *Cicindela pulchra* and the one described as *pulchra* may be *obsoleta*.

The larvae were collected at Haswell, Colorado, on the prairie in adobe or slightly gravelly soil. The burrows were located in the bare spaces between tufts of grass, they were from 5 to 7 inches deep, slightly spiral, with the bottom often enlarged to about three-eighths of an inch in diameter.

Of 34 larvae collected on August 25, 1916, 4 were parasitized with 7 parasites. Two had one parasite each, another larva had

2 parasites and a fourth larva had three parasites attached. The larval parasites were attached on the side of the abdomen between the second and sixth abdominal segments. No uniformity appeared to exist as to the point or method of attachment.

The parasites were Dipterous larvae about one-sixteenth to one-eighth of an inch long. They are probably those of the bee-fly, *Sporogostylum anale*, which Shelford describes as parasitizing *Cicindela scutellaris lecontei*.

CICINDELA HYBRIDA Linnaeus.

Figs. 154, 166, and 177.

E. ROSENBERG, Seeland, Denmark, reared, larvae deposited in the United States National Museum by Dr. A. Boving.

Color.—Head and pronotum bright purplish bronze with a greenish blue reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect long, slightly flattened and prominent; diameter of ocellus 2 equal to the distance between ocelli 1 and 2; fronto-clypeo-labral area slightly wider than long; U-shaped ridge on caudal part of frons bearing three setae, the middle one indistinct; antenna with the proximal and second segments subequal, the third two-thirds and the distal one-half the length of the second, the proximal segment with five or six setae and the second with 9 or 10; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at the ventro-distal end, proximal segment of labial palpus with three spinelike projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending as far cephalad as the mesal portion, lateral margins carinate, primary setae not large or distinct, secondary setae short, slightly flattened and numerous (fig. 154).

Abdomen.—Chitinized areas distinct, secondary setae short, small and not numerous (fig. 166); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; median hooks with four setae; inner hooks with two setae, the spine-like projection not more than one-fifth the length of the hook (fig. 177).

Measurements.—Length of larvæ, 20 to 23 mm., width at the third abdominal segment, 2.5 to 3.9 mm.; diameter of ocellus 2, 0.26 to 0.28 mm.; distance between ocelli 1 and 2, 0.26 to 0.28 mm.; length of fronto-clypeo-labral area, 1.65 to 1.75 mm., width, 1.95 to 2.05 mm.; length of pronotum, 2.1 to 2.3 mm., width 3.4 to 3.6 mm.

This species is a European form and may be distinguished from its nearest forms by the four distinct setae on the median hooks, the number of setae on the pronotum, and the shape of the inner hooks.

CICINDELA HYBRIDA MARITIMA Dejean.

Figs. 155, 167, and 176.

HORN, W., reared, larvæ in the collection of the University of Illinois.

Color.—Head and pronotum bright coppery bronze with a green reflection; setae on dorsal aspect of head and pronotum white, the other setae transparent or brown.

Head.—Setae on dorsal aspect short and not conspicuous; diameter of ocellus 2 sub-equal to the distance between ocelli 1 and 2; fronto-clypeo-labral area slightly wider than long; U-shaped ridge on caudal part of frons bearing three or more setae; antenna with the proximal segment slightly shorter than the second, the third two-thirds and the fourth slightly less than one-half the length of the second, the proximal and second segments each with twelve to fourteen setae; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae on the ventro-distal end arranged in a transverse row, proximal segment of labial palpus with three spine-like projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending as far cephalad as the cephalo-mesal portion, lateral margins carinate, primary setae slightly longer than the secondary setae and not conspicuous, secondary setae short, conspicuous, slightly flattened and numerous (fig. 155).

Abdomen.—Chitinized areas distinct; secondary setae few, short, and inconspicuous (fig. 167); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with three setae; inner hooks with two setae, the spine-like projection about one-third the length of the hook (fig. 176).

Measurements.—Length of larvae, 15 to 18 mm.; width at the third abdominal segment, 1.7 to 2 mm.; diameter of ocellus 2, 0.29 to 0.31 mm.; distance between ocelli 1 and 2, 0.29 to 0.31 mm.; length of fronto-clypeo-labral area, 1.7 to 1.8 mm.; width, 1.9 to 2.1 mm.; length of pronotum, 2 to 2.1 mm.; width, 3.2 to 3.6 mm.

This is an European species and is given as a variety of *Cicindela hybrida*. It may be separated from the preceding by the larger number of setae on the proximal and second segments of the antennae and by the larger number of setae on the pronotum, also by the

ninth abdominal sternum with the caudal margin bearing two groups of three instead of four setae and by the longer spine-like projection of the inner hook.

CICINDELA HIRTICOLLIS Say.

Figs. 55, 56, 57, 91, 92, 93, and 146.

SHELFORD, reared, larvae in the collection of the University of Illinois, the U. S. National Museum, and the author's collection.

1908, SHELFORD, Journ. Linn. Soc. Lond., Zool., vol. 30, p. 172.

Color.—Head and pronotum a bright coppery color with a green reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect short, somewhat flattened, numerous and prominent; diameter of ocellus 2 slightly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area wider than long; U-shaped ridge on caudal part of frons bearing three setae; antenna with the proximal segment slightly shorter than the second, the third three-fourths and the distal one-half the length of the second, the proximal segment with seven to nine setae and the second with ten to twelve; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at the ventro-distal end, proximal segment of labial palpus with three spine-like projections on the ventro-distal margin and with two setae on each side of these spines; the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles not extending as far cephalad as the mesal portion, lateral margins slightly carinate, primary setae not easily distinguished from the secondary setae, secondary setae short, flattened and numerous (fig. 57).

Abdomen.—Chitinized areas distinct, secondary setae short, few and not prominent (fig. 93); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; median hooks with two setae; inner hooks with two setae, the spinelike projection about one-fourth the length of the hook (fig. 146).

Measurements.—Length of larvae, 17 to 19 mm., width at the third abdominal segment, 2.2 to 2.4 mm.; diameter of ocellus 2, 0.30 to 0.33 mm.; distance between ocelli 1 and 2, 0.27 to 0.30 mm.; length of fronto-clypeo-labral area, 1.4 to 1.6 mm.; width, 1.8 to 2 mm.; length of pronotum, 1.8 to 2.1 mm.; width, 2.9 to 3.2 mm.

The larvae of this species are rather distinctive and easily recognized by the large number of white, flattened or scalelike setae on the pronotum. The only other American larva studied which resembles it in this respect is *Cicindela limbata* which has only about

half as many setae on the pronotum and which are not so distinctly flattened.

The larvae are very restricted in their habitat, occurring only in moist, clean sand which has very little or no humus, as on the beach of Lake Michigan. The burrows are vertical and about 5 inches deep. The eggs are deposited in late June or July and the larvae reach the third instar some time in September, close their burrows in October and hibernate. The burrows are opened in May of the following year and the larvae pupate in June or July. The adults emerge in August, hibernate over the winter and become sexually mature the following spring.

CICINDELA LIMBATA Say.

Figs. 77, 114, and 145.

SHELFORD, not reared, larvæ in the collection of the University of Illinois.

Color.—Head and pronotum bright coppery bronze, with a green or blue reflection; setae on dorsal aspect of head and pronotum white, the other setae brown.

Head.—Setae on dorsal aspect medium in length, slightly flattened and prominent; diameter of ocellus 2 distinctly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area as long as broad; U-shaped ridge on caudal part of frons bearing three setae; antenna with the proximal segment slightly shorter than the second, the third a little more than one-half and the distal one-third the length of the second, the proximal segment with 12 or 13 setae and the second with 9 or 10; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented; ligula with four fine setae arranged in a transverse row at the ventro-distal end, proximal-segment of labial palpus with three spine-like projections on the ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles not extending as far cephalad as the mesal portion, lateral margins carinate, primary setae not large or distinct, secondary setae short, slightly flattened and numerous (fig. 77).

Abdomen.—Chitinized areas distinct, secondary setae short, small, and not numerous (fig. 114); ninth abdominal sternum with the caudal margin bearing two groups of 3 setae each; median hooks with 3 setae; inner hooks with 2 setae, the spinelike projection one-third the length of the hook (fig. 145).

Measurements.—Length of larvae, 15 to 17 mm.; width at the third abdominal segment, 1.8 to 2 mm.; diameter of ocellus 2, 0.23 to 0.25 mm.; distance between ocelli 1 and 2, 0.20 to 0.21 mm.; length of

fronto-clypeo-labral area, 1.45 to 1.55 mm.; width, 1.45 to 1.55 mm.; length of pronotum, 1.5 to 1.6 mm.; width, 2.4 to 2.6 mm.

The larvae were collected at Wray, Colorado, in bare, white sand blowouts. The burrows were straight or slightly spiral, from 10 to 14 inches deep, and occurred in clusters of a dozen or more to the square foot. The larvae of *Cicindela lepida* were dug from the same situations.

Criddle (1907) states that the larvae occur in large, sandy blowouts with scant vegetation. They are also sometimes found in small patches of shifting soil but are always much more plentiful in white sand, which is constantly drifting. The depth of the burrows varied from 7 to 17 inches. The life cycle requires 3 years at Aweme, Manitoba, approximately 2 years are required for the larval stage and 1 year for the adult stage. He also writes that the larvae are able to withstand much more cold than the adults, the larvae remaining out until the latter part of October.

2. Genus TETRACHA Hope.

Head with the ridge on caudal part of frons transverse and continuous with the ridge on the caudal part of the vertex; latero-clypeus distinct, crescent-shaped; anterior margin of labrum smooth; ocelli 1 and 2 subequal in size; ocelli 3 and 4 not adjacent; ocelli 5 and 6 present; antenna separated from the mandible by a narrow, transverse, chitinized bar, the second segment not longer than the other segments combined; maxilla with the ventral sclerite of the cardo triangular and bearing one large and one small seta; lacinia apparently absent; maxillary palpus three-segmented, the proximal segment the shortest, the second and distal segments subequal in length, the proximal segment with a spine on the latero-distal end; labio-stipites concave and with a prominent carina on the lateral and caudal margins; ligula not chitinized on the ventral aspect; palpiger area membranous and without chitinized sclerites; labial palpus with the proximal segment shorter than the distal segment and without spinelike projections on its ventro-distal end, the proximal segment with 6 to 8 setae and the distal segment with 1; fifth abdominal segment with the inner and median hooks present, the lateral hooks wanting, median hooks straight, thornlike, and bearing 1 or 2 stout setae; inner hooks similar in shape to the median hooks, about one-half their length, and bearing 2 fine, inconspicuous setae. Legs with distinct, movable tarsal claws.

This genus is represented by two species from the United States, both of which occur in the southern and southeastern part, and one species from Europe. In many respects the larvae are very closely related to those of the genus *Cicindela*. They can be separated from

them by the transverse ridge on the caudal part of the frons and its connection with the ridge on the caudal part of the vertex, the length of the segments of the maxillary palpus, the shape of the labium, the length of the segments of the labial palpus, and by the hooks on the fifth abdominal segment.

TABLE TO THE SPECIES OF THE GENUS *TETRACHA*.

- Median hooks each with but a single stout seta; lateral and caudal margins of pronotum pearly white----- 1
 Median hooks each with two short, stout setae; lateral and caudal margins of pronotum brown-----*euphratica*, p. 58.
 1. Diameter of ocellus 2 slightly greater than the distance between ocelli 1 and 2; pronotum less than four millimeters in width, color of pronotum a dark purple; secondary setae on abdomen not numerous and found only on the chitinized areas-----*carolina*, p. 59.
 Diameter of ocellus 2 slightly less than the distance between ocelli 1 and 2; pronotum 4.5 mm. or more in width, color a dark purplish bronze with a green reflection; secondary setae on abdomen numerous and found between as well as upon the chitinized areas-----*virginica*, p. 60.

DESCRIPTION OF SPECIES.

TETRACHA EUPHRATICA Latrille and Dejean.

Figs. 156 and 168.

MAYET, reared, larvae deposited in the U. S. National Museum by Dr. A. Boving.

Color.—Head and pronotum a purplish bronze, head with a distinct blue reflection, lateral and caudal margin of pronotum dark brown; setae brown.

Head.—Setae on dorsal aspect long and prominent; diameter of ocellus 2 distinctly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area longer than wide; transverse ridge on caudal part of frons with three setae; antenna with the proximal segment slightly longer than the second, the third one-half and the distal slightly more than one-fourth the length of the second, the proximal and second segments each with 12 to 14 setae; maxilla with the proximal segment of the galea bearing 4 stout setae on its mesal margin; (labium damaged so that characters could not be described).

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal portion, lateral margins very slightly carinate; primary setae large and prominent, secondary setae small and not numerous (fig. 156).

Abdomen.—Chitinized areas distinct, secondary setae short, fine, and moderately numerous, few occurring between the chitinized areas (fig. 168); median hooks with two prominent setae; inner hooks slightly more than one-half the length of the median hooks, and with two fine, inconspicuous setae; two prominent setae cephalad of

the inner hooks and mesad of the distal half of the median hooks arranged transversely.

Measurements.—Length of larva, 28 to 30 mm., width at the third abdominal segment, 3.5 to 4 mm.; diameter of ocellus 2, 0.65 mm.; distance between ocelli 1 and 2, 0.45 mm.; length of fronto-clypeo-labral area, 3.3 mm.; width, 3 mm.; length of pronotum, 3.8 mm.; width, 4.9 mm.

This larva is an European form and can be distinguished from the American species by the absence of the pearly white color on the lateral and caudal margins of the pronotum, by the greater proportional diameter of ocellus 2 to the distance between ocelli 1 and 2, and by the two prominent setae on the median hooks.

TETRACHA CAROLINA Linnaeus.

Figs. 2, 9, 15, 18, 24, 29, 34, 43, 80, and 116.

SHELFORD, reared, larvae in collection at University of Illinois, the U. S. National Museum, and author's collection.

Color.—Head and pronotum dark purple with a green reflection, lateral and caudal margins of pronotum pearly white; setae brown, some of those on the head and pronotum occasionally white.

Head.—Setae on dorsal aspect long, slightly flattened, and prominent; diameter of ocellus 2 slightly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area longer than wide; transverse ridge on caudal part of frons with three setae; antenna with the proximal segment slightly longer than the second, the third slightly more than one-half, and the distal slightly less than one-half the length of the second, setae long and stout, the proximal segment with nine to eleven setae and the second with eleven to thirteen; maxilla with the proximal segment of the galea bearing four setae on its mesal margin; ligula with four fine setae at its ventro-distal end not in a transverse row, the two mesal setae caudad of the lateral ones, proximal segment of the labial palpus with six or seven setae, the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending cephalad of the mesal portion, lateral margins slightly carinate, primary setae large and prominent, secondary setae small and not numerous (fig. 80).

Abdomen.—Chitinized areas distinct, secondary setae short, fine, not numerous, few occurring between the chitinized areas (fig. 116); median hooks with a single prominent setae; inner hooks about one-half the length of the median hooks and with two fine, inconspicuous setae; three prominent setae cephalad of the mesal hooks and mesad of the distal half of the inner hooks usually forming a longitudinal row.

Measurements.—Length of larvae, 25 to 30 mm.; width at the third abdominal segment, 3 to 4 mm.; diameter of ocellus 2, 0.40 to 0.43 mm.; distance between ocelli 1 and 2, 0.37 to 0.40 mm.; length of fronto-clypeo-labral area, 2.3 to 2.5 mm.; width, 2 to 2.2 mm.; length of pronotum, 2.4 to 2.6 mm.; width, 3.5 to 3.8 mm.

Larvae have been collected from a variety of situations and they are not as restricted in their habitat as most of the larvae of the Cicindelidae. Dr. V. E. Shelford has dug the larvae at Yuma, Arizona; Galveston and Houston, Texas; Mobile, Alabama; and Columbus, Georgia. Those dug at Houston, Texas, were taken from bare, artificially exposed soil of a fine moldable nature, not sticky. At Galveston, Texas, the larvae were dug along the beach from moist sand covered with a scattered growth of vegetation. Those collected at Columbus, Georgia, were dug from moist, clayey soil. A. H. Manee collected the larvae at Southern Pines, North Carolina, from hard, stony, and gravelly soil, clayey soil, and moist, loose black soil. The openings to the burrows are large, the burrows straight or slightly inclined from the vertical, and from 8 to 12 inches deep.

TETRACHA VIRGINICA Linnaeus.

Figs. 79 and 117.

MANEE, reared, larvae in the collection of the University of Illinois, U. S. National Museum and the author's collection.

Color.—Head and pronotum very dark bronze with a green reflection, lateral and caudal margins of pronotum pearly white; setae brown, some of those on the head and pronotum occasionally white.

Head.—Setae on dorsal aspect long, slightly flattened and prominent; diameter of ocellus 2 slightly less than the distance between ocelli 1 and 2; fronto-clypeo-labral area longer than wide; transverse ridge on caudal part of frons bearing three setae; antenna with the proximal segment slightly longer than the second, the third one-half and the distal slightly less than one-half the length of the second, the proximal segment with 11 to 13 setae and the second with 10 to 11; maxilla with the proximal segment of the galea bearing four setae on its mesal margin; ligula with four fine setae at its ventro-distal end not arranged in a transverse row, the two mesal setae caudad of the lateral ones; proximal segment of the labial palpus with five to seven setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending cephalad of the mesal portion, lateral margins slightly carinate, primary setae large and prominent, secondary setae small and not numerous (fig. 79).

Abdomen.—Chitinated areas distinct; secondary setae numerous, part of them long and slender, the others short and fine and occurring

between the chitinized areas (fig. 117); median hooks with a single prominent seta; inner hooks about one-half the length of the median hooks and with two fine, inconspicuous setae; two of the large setae cephalad of the mesal hooks and mesad of the distal half of the median hooks usually forming a transverse or almost transverse row.

Measurements—Length of larvae, 28 to 30 mm., width at the third abdominal segment, 4 to 5 mm.; diameter of ocellus 2, 0.46 to 0.43 mm.; distance between ocelli 1 and 2, 0.43 to 0.50 mm.; length of fronto-clypeo-labral area, 2.75 to 2.85 mm.; width, 2.45 to 2.55 mm.; length of pronotum, 2.9 to 3.2 mm.; width, 4 to 4.5 mm.

This species is similar to *Tetracha carolina* but can be separated from it by its larger size, the absence of a distinct purple color to the pronotum, the presence of a large number of secondary setae on the membranous area of the abdomen, and the different arrangement of the setae cephalad of the inner hooks and mesad of the distal half of the median hooks.

The larvae were collected at Southern Pines, North Carolina, by A. H. Manee in sandy and gravelly soil, clayey soil, and in moist, loose, soil. They occurred in the same situations as *Tetracha carolina*. I have collected larvae at College Park, Maryland, from clayey and gravelly soil along paths which were not frequently used. The openings to the burrows are about three-eighths of an inch in diameter, the burrows are straight or slightly inclined from the vertical and from 8 to 12 inches deep.

3. Genus COLLYRIS Fabricius.

Head with ridge on caudal part of frons U-shaped and not continuous with the ridge on the caudal part of vertex, U-shaped ridge not prominent; latero-clypeus distinct, crescent-shaped; anterior margin of the labrum narrow and rectangular; ocellus 1 about twice the diameter of ocellus 2, ocelli 3 and 4 subequal in size and adjacent, ocelli 5 and 6 wanting; antenna separated from the mandible by a narrow chitinized bar, the second segment not longer than the other segments combined; maxilla with the ventral segment of the cardo triangular, lacinia apparently absent, maxillary palpus two-segmented, the distal segment slightly the longest, the proximal segment without a spine on the latero-distal margin; labio-stipites with a slight furrow along the meson and without a carina on the lateral and caudal margins, ligula not chitinized on the ventral aspect, palpiger area with a single chitinized sclerite, labial palpus with the proximal and distal segments subequal in length, the proximal segment with two spinelike projections on its ventro-distal margin, the proximal segment with three or four setae and the distal seg-

ment with one; fifth abdominal segment with the inner, median and lateral hooks present, the inner and median hooks short, bluntly thornlike and each bearing one or two setae, lateral hooks small, thornlike and produced at the anterior end of a chitinized area laterad of the median hooks. Legs without distinct, movable tarsal claws, the distal end of the tarsi produced into two blunt, pointed projections serving as claws.

DESCRIPTION OF SPECIES.

COLLYRIS EMARGINATUS Dejean or **BONELLII** Guérin.

Figs. 185-196.

HORN, W., not reared, larva in the collection of the University of Illinois.
From Buitenzorg, Java.

SHELFORD, R., 1905, Proc. Entom. Soc. Lond., p. 72.

Color.—Head and pronotum chestnut brown with the region around the ocelli almost black; setae transparent.

Head.—Setae on dorsal aspect fine and inconspicuous; diameter of ocellus 2 greater than the distance between ocelli 1 and 2; frontoclypeo-labral area as long as broad; U-shaped ridge on caudal part of frons not prominent and bearing three fine inconspicuous setae; antenna with the proximal and third segments subequal in length, the second and distal segments also subequal in length and slightly shorter than either the proximal or third segments, the proximal and second segments each with five or six setae, the third with two setae and the distal with one; maxilla with the proximal segment of the galea bearing two setae on its mesal margin, maxillary palpus two-segmented; the proximal segment slightly shorter than the distal; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with two spine-like projections on its ventro-distal margin and with one seta on each side of these spines, the proximal segment with three setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending distinctly cephalad of the mesal chitinized portion and with an oval rounded mound on each lateral part, lateral margins not carinate, setae fine and inconspicuous (fig. 187).

Abdomen.—Chitinized areas indistinct, setae fine and not numerous (figs. 185 and 186); ninth abdominal sternum with the caudal margin bearing two groups of three setae each; tenth abdominal segment with three spinelike projections on each caudo-lateral margin; fifth abdominal segment with three pair of similar hooks, the inner and median hooks each with two fine inconspicuous setae (fig. 185).

Measurements.—Length of larvae, 10 to 12 mm., width at the third abdominal segment about 1.5 mm.; diameter of ocellus 2, 0.1 mm., distance between ocelli 1 and 2, 0.15 mm.; length of fronto-clypeo-labral area, 0.7 mm., width, 0.7 mm.; length of pronotum, 0.75 mm., width, 1.25 mm.

Walter Horn, in the *Genera Insectorum* (fasc. 82, p. 99) states that Konigsberger (1897) discovered the larva in the Botanical Gardens of Buitenzorg (Java) living in the small twigs of the coffee tree. The larva hollows out a cavity in the pith one and one-half as long as the larva itself. The opening to the outside is at a right angle and round about it the twig is somewhat thickened (fig. 190). Walter Horn also states in the *Genera Insectorum* (fasc. 82, p. 428) that "Keiner der Autoren hat die Larven von *C. Bonelli* und *C. emarginata* auseinander halten können." Since the larva described by myself came from Horn, I am unable to say whether it is *C. bonelli* or *C. emarginata*.

4. Genus (probably) CTENOSTOMA Klug.

Head with the ridge on the caudal part of the frons slightly sinuate and continuous with the ridge on the caudal part of the vertex; arms of the epicranial suture not uniting into a stem but separated by the caudal part of the frons, which reaches to the occipital foramen; latero-clypeus distinct, crescent-shaped; anterior margin of the labrum smooth; ocelli 1 and 2 subequal in size, ocelli 3 and 4 subequal in size, adjacent; ocelli 5 and 6 wanting; antenna separated from the mandible by a narrow, inconspicuous, transverse bar, the second segment not longer than the other segments combined; maxilla with the ventral sclerite of the cardo triangular and bearing a single setae, lacinia apparently absent, maxillary palpus three-segmented, increasing slightly in length from the proximal to the distal segment, the proximal segment without a spine on the latero-distal margin; labio-stipites without a furrow along the meson but with a distinct ridge or carina along the lateral and caudal margins, ligula not chitinized on the ventral aspect, palpiger area with two chitinized sclerites separated by a flexible suture, labial palpus with the proximal segment longer than the distal segment and with two spinelike projections on its ventro-distal margin, the proximal segment with four or five setae and the distal segment with one; fifth abdominal segment with the inner, median, and lateral hooks present, the inner hooks short and thornlike, the median hooks somewhat sickle-shaped and pointing outward, the lateral hooks short, thorn-shaped, and produced at the anterior end of a chitinized sclerite

laterad of the median hooks. Legs without distinct, movable tarsal claws, the distal end of the tarsi produced into two blunt, pointed projections serving as claws.

DESCRIPTION OF SPECIES.

CTENOSTOMA (?) species.

Figs. 157, 182, 183, and 184.

SCHWARZ, E. A., not reared, larva in the collection of the U. S. National Museum.

Color.—Head and pronotum chestnut brown, with the region around the ocelli, the anterior margin of the fronto-clypeo-labral sclerite, and the anterior margin of the pronotum almost black; setae transparent.

Head.—Setae on dorsal aspect fine and inconspicuous; diameter of ocellus 2 distinctly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area longer than wide, ridge on the caudal part of frons sinuate, prominent, and bearing a single prominent setae; antenna with the proximal, second, and third segments subequal, the distal segment one-half to two-thirds the length of the third, the proximal and second segments each with five or six setae, the third with two setae, and the distal with one; maxilla with the proximal segment of the galea bearing three setae on its mesal margin, maxillary palpus three-segmented, each segment slightly increasing in length toward the distal; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with two spinelike projections on its ventro-distal margin and with two setae on each side of these spines, the proximal segment with four setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal, chitinized portion, lateral margins carinate, an oblong-oval, slightly raised mound on each lateral part; setae short, stout, numerous, and inserted on small setal mounds (fig. 157).

Abdomen.—Chitinized areas indistinct, setae fine and not numerous (fig. 183); ninth abdominal sternum with the caudal margin bearing two groups of four setae each and the tergum with two short spines on the caudal margin; tenth abdominal segment with four short, stout spines on its dorsal margin and with each lateral sclerite produced caudad into a short, blunt, chitinized projection (fig. 183); fifth abdominal segment with three pairs of hooks, the inner hook with two short, stout setae, the median hooks with three fine, inconspicuous setae (fig. 184).

Measurements.—Length of larvae, 17 mm., width at the third abdominal segment, 2.5 mm.; diameter of ocellus 2, 0.31 mm.; dis-

tance between ocelli, 1 and 2, 0.17 mm.; length of fronto-clypeo-labral area, 1.6 mm., width, 1.4 mm.; length of pronotum, 1.7 mm., width, 3 mm.

This larva was collected March, 1911, by Dr. E. A. Schwarz at Porto Bello, Panama, in a dead branch of a tree among a colony of ants. Its structure indicates that it belongs to the arboreal group. Because of its importance morphologically it has been included and placed tentatively in the genus *Otenostoma* Klug.

5. Genus OMUS Eschscholtz.

Head with the ridge on the caudal part of frons transverse and continuous with the ridge on the caudal part of vertex; latero-clypeus distinct, crescent-shaped; anterior margin of the labrum crenulate; ocellus 2 about one-half the size of ocellus 1, ocelli 3 and 4 distinct, subequal in size, ocellus 5 small, conical, and distinct, ocellus 6 about one-half the size of ocellus 5, small and indistinct; antenna not separated from the mandible by a transverse, chitinized bar, the proximal, second, and third segments subequal in length, the distal segment about one-half the length of the second; maxilla with the ventral sclerite of the cardo triangular and bearing two setae; a small spine, possibly a rudimentary lacinia, present on the inner and distal margin of the stipes, maxillary palpus three-segmented, the segments increasing slightly in length from the proximal to the distal, the proximal segment without a spine on the latero-distal margin; labio-stipites not depressed on the middle and without a carina on the lateral and caudal margins; ligula not chitinized on the ventral aspect; palpiger area with two chitinized sclerites separated by a flexible suture; labial palpus with the proximal segment longer than the distal segment and with a single spinelike projection on its ventro-distal margin, the proximal segment with two setae and the distal segment with one; fifth abdominal segment with the inner, median, and lateral hooks present, the lateral hooks short and bearing from six to eight setae, the median hooks long, the proximal half cylindrical and the distal half thornlike, slightly curved ventrad, and with two setae at about the middle, inner hooks about one-half the length of the median hooks, the proximal two-thirds cone-shaped and with two setae at its distal part, the distal one-third thornshaped and projecting cephalad.

This genus occurs only on the Pacific coast from British Columbia to the southern part of California. There are a number of species and sub-species, the adults of which are difficult to separate. The larvae are also very difficult to separate, and a study of a large series would probably aid in the nomenclature of the adults.

TABLE TO THE SPECIES OF THE GENUS OMUS.

Cephalic margin of the labrum with the crenulate emarginations deep; pronotum distinctly lighter colored than the head; tergal sclerites of the abdomen with two large, adjacent setae on the lateral margin.

californicus, p. 66.

Cephalic margin of the labrum with the crenulate emarginations shallow; pronotum but little, if any, lighter colored than the head; tergal sclerites of the abdomen usually with three large, adjacent setae on the lateral margin----- 1

1. Cephalic margin of the labrum with the median crenulate lobe distinctly wider than those on each side; pronotum with more than sixty setae.

ambiguus, p. 67.

Cephalic margin of the labrum with the median crenulate lobe not distinctly wider than those on each side; pronotum never with more than fifty setae.

sequoiarum, p. 68.

DESCRIPTION OF SPECIES.

OMUS CALIFORNICUS Eschscholtz.

Figs. 3, 12, 13, 19, 25, 30, 35, 44, 46, 82, 83, 84, 118, and 119.

BLAISDELL, reared, larvae in the collection of Dr. A. D. MacGillivray, University of Illinois.

Color.—Head dark bronze or black, uniformly colored; pronotum light chestnut brown; setae on dorsal aspect of head and pronotum the same color as the head, the other setae light brown.

Head.—Setae on dorsal aspect long, slender, and prominent; diameter of ocellus 2 slightly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area wider than long; transverse ridge on caudal part of frons bearing five setae, the middle seta much larger than those on each side; cephalic margin of the labrum with the crenulate emarginations deep, the median lobe not distinctly wider than those on each side (fig. 46); antenna with the proximal, second, and third segments subequal in length, the distal segment one-half the length of the second, the proximal segment with four or five setae and the second with five or six; maxilla with the proximal segment of the galea bearing three setae on its mesal margin; ligula with four fine setae arranged in a transverse row on its ventro-distal end, proximal segment of labial palpus with a single spinelike projection on the ventro-distal margin and with a single seta on each side of this spine, the proximal segment with two setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending as far cephalad as the mesal portion, lateral margins slightly carinate, setae not more than 40 in number (fig. 84).

Abdomen.—Chitinized areas distinct; secondary setae short and not numerous and with two large, adjacent setae on the lateral margin of the tergal sclerites (fig. 119); ninth abdominal sternum with

the caudal margin bearing two groups of four setae each; inner hooks five-eighths the length of the median hooks and with two setae; median hooks with two setae; lateral hooks with five to seven setae.

Measurements.—Length of larvae, 26 to 28 mm., width at the third abdominal segment, 3.2 to 3.4 mm.; diameter of ocellus 1, 0.51 to 0.54 mm., of ocellus 2, 0.36 to 0.38 mm.; distance between ocelli 1 and 2, 0.29 to 0.31 mm.; length of fronto-clypeo-labral area, 2.4 to 2.6 mm., width 2.7 to 2.8 mm.; length of pronotum, 2.9 to 3.2 mm., width 5 to 5.2 mm.

The larvae were collected at Alhambra Valley, Contra Costa County, California, December 29, 1905, by Dr. F. E. Blaisdell, sr.

OMUS AMBIGUUS Schaupp.

Figs. 47, 86, and 121.

BLAISDELL, reared, larvae in the collection of Dr. A. D. MacGillivray, University of Illinois.

Color.—Head dark brown or bronze, the cephalic portion between the mandibles lighter; pronotum dark chestnut brown, slightly lighter than the caudal part of the head; setae on dorsal aspect of head and pronotum dark brown, the other setae light brown.

Head.—Setae on dorsal aspect long, stout, and prominent; diameter of ocellus 2 equal to the distance between ocelli 1 and 2; fronto-clypeo-labral area wider than long; transverse ridge on the caudal part of frons bearing five setae, the middle seta much larger than those on each side; cephalic margin of the labrum with the crenulate emarginations shallow, the median lobe distinctly wider than those on each side (fig. 47); antenna with the proximal segment slightly longer than the second, the third as long as the second, and the fourth slightly more than one-half the length of the second, the proximal segment with four or five setae and the second with five or six; maxilla with the proximal segment of the galea bearing three setae on its mesal margin; ligula with four fine setae arranged in a transverse row on its ventro-distal end, the proximal segment of the labial palpus with a single spinelike projection on the ventro-distal margin and with a single seta on each side of this spine, the proximal segment with two setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending slightly cephalad of the mesal portion, lateral margins slightly carinate, setae more than 60 in number (fig. 86).

Abdomen.—Chitinized areas distinct; secondary setae numerous and prominent, lateral margins of tergal sclerites usually bearing three large, adjacent setae (fig. 121); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; inner hooks

five-eighths the length of the median hooks and with two setae; median hooks with two setae; lateral hooks with six to eight setae.

Measurements.—Length of larvae, 26 to 28 mm., width at the third abdominal segment, 3.2 to 3.4 mm.; diameter of ocellus 1, 0.50 to 0.52 mm., of ocellus 2, 0.30 to 0.32 mm.; distance between ocelli 1 and 2, 0.30 to 0.32 mm.; length of fronto-clypeo-labral area, 2.6 to 2.8 mm., width, 2.3 to 2.5 mm.; length of pronotum, 2.7 to 2.9 mm., width, 4.7 to 5 mm.

The larvae were collected at Shasta Retreat, Siskiyou County, California, July 31, 1905, by Dr. F. E. Blaisdell, sr., and Beverly Letcher.

OMUS SEQUOJARUM Crotch.

Figs. 45, 85, and 120.

BLAISDELL, reared, larvae in the collection of Dr. A. D. MacGillivray, University of Illinois.

Color.—Head dark bronze or black and uniformly colored; pronotum dark chestnut brown with lighter areas; setae on dorsal aspect of head and pronotum the same color as the head, the other setae light brown.

Head.—Setae on dorsal aspect long, stout, and prominent; diameter of ocellus 2 slightly greater than the distance between ocelli 1 and 2; fronto-clypeo-labral area wider than long; transverse ridge on caudal part of frons bearing five setae, the median seta much larger than those on each side; cephalic margin of the labrum with the crenulate emarginations shallow, the median lobe not distinctly wider than those on each side (fig. 45); antenna with the proximal segment as long as the second, the third slightly less than the length of the second, and the distal slightly more than one-half the length of the second, the proximal segment with four or five setae and the second with five or six; maxilla with the proximal segment of the galea bearing three setae on its mesal margin; ligula with four fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with a single spine-like projection on its ventro-distal margin and with a single seta on each side of this spine, the proximal segment with two setae and the distal segment with one.

Thorax.—Pronotum with the cephalo-lateral angles extending almost as far cephalad as the mesal portion, lateral margins slightly carinate, setae not more than fifty in number (fig. 85).

Abdomen.—Chitinized areas distinct; secondary setae prominent and numerous, tergal sclerites with three large, adjacent setae on the lateral margins (fig. 120); ninth abdominal sternum with the caudal margin bearing two groups of four setae each; inner hooks

five-eighths the length of the median hooks, and with two setae; median hooks with two setae; lateral hooks with five to seven setae.

Measurements.—Length of larvae, 24 to 26 mm., width at the third abdominal segment, 3.2 to 3.4 mm.; diameter of ocellus 1, 0.42 to 0.44 mm., of ocellus 2, 0.29 to 0.31 mm.; distance between ocelli 1 and 2, 0.26 to 0.28 mm.; length of fronto-clypeo-labral area, 2.1 to 2.3 mm., width, 2.4 to 2.6 mm.; length of pronotum, 2.6 to 2.8 mm., width, 4 to 4.3 mm.

The larvae were collected at Licking Fork, Mokelumne River, California, at an elevation of 2,900 to 3,100 feet, by Dr. F. E. Blaisdell, sr., and Beverly Letcher.

A single larva of *Omus edwardsii* Crotch, the identity of which was questioned, was secured from Dr. F. E. Blaisdell, sr.; this larva was collected in the same locality as *Omus sequoiarum* and seems to be identical with it (figs. 48, 87, and 122). The pronotum (fig. 87) shows a few more setae than that of *Omus sequoiarum* (fig. 85), but the larvae of the later species were observed which had a similar setal plan.

6. Genus AMBLYCHILA Say.

Head with ridge on caudal part of frons transverse and continuous with the ridge on caudal part of vertex; latero-clypeus not distinct, fused with the clypeus; anterior margin of the labrum slightly crenulate; ocellus 2 much smaller than ocellus 1, ocelli 3 and 4 small, adjacent and rudimentary, ocelli 5 and 6 wanting; antenna separated from the mandible by a broad, chitinized area, second segment of the antenna longer than all the other segments combined; maxilla with the ventral sclerite of the cardo triangular and bearing eight or nine setae; lacinia apparently absent; maxillary palpus three-segmented, the proximal and second segments subequal in length and slightly longer than the third, the proximal segment without a spine on the latero-distal margin; labio-stipites heavily chitinized, concave, and with a prominent carina on the lateral and caudal margins; ligula chitinized on the ventral aspect, the chitinization of the ligula and the labio-stipites extending around the palpiger; palpiger area membranous and without a sclerite; labial palpus with the proximal segment shorter than the distal segment and without spinelike projections on its ventro-distal margin, the proximal segment with 5 or 6 setae and the distal segment with 12 to 15; fifth abdominal segment with the inner and median hooks present, the lateral hooks wanting, median hooks bluntly thorn-shape, broad at the base, and with 18 to 20 short, stout setae; inner hooks similar in shape to the median hooks, about one-half their length, and with 12 to 15 short, stout setae.

The genus *Amblychila* includes three species, all of which are limited in their distribution. The larvae are larger, fleshier, and more grublike than the larvae of any of the other genera studied.

DESCRIPTION OF SPECIES

AMBLYCHILA CYLINDRIFORMIS Say.

Figs. 4, 10, 11, 16, 20, 26, 31, 36, 41, 81, 123, and 148.

HUNGERFORD and WILLIAMS, reared, larvae in the Department of Entomology, University of Kansas.

Color.—Head and pronotum dark chestnut brown; setae brown.

Head.—Setae on dorsal aspect of head long, slender, and prominent; ocellus 2 about one-half the size of ocellus 1; diameter of ocellus 2 subequal to the distance between ocelli 1 and 2; fronto-clypeo-labral area wider than long; transverse ridge on the caudal part of frons with 6 to 8 setae; crenulate emarginations on the anterior edge of the labrum subequal; antenna with the second segment twice the length of the proximal, three times the length of the third and ten times that of the distal segment, setae long and slender, the proximal segment with 6 to 12 setae and the second with 15 to 20 (fig. 126); maxilla with the proximal segment of the galea bearing 5 or 6 setae on its mesal margin; ligula with six fine setae arranged in a transverse row at its ventro-distal end, proximal segment of labial palpus with 5 or 6 setae and the distal segment with 12 to 15 (fig. 20).

Thorax.—Pronotum with the cephalo-lateral angles extending cephalad of the mesal portion, lateral margins slightly carinate, setae numerous, short, and conspicuous (fig. 81).

Abdomen.—Chitinized areas indistinct; setae short to long, numerous, and occurring between as well as upon the chitinized areas (fig. 123); median hooks with 18 to 20 setae; inner hooks with 12 to 15 setae (fig. 148).

Measurements.—Length of larvae, 45 to 50 mm., width at the third abdominal segment, 7 to 8 mm.; diameter of ocellus 1, 0.40 to 0.45 mm., of ocellus 2, 0.20 to 0.27 mm.; distance between ocelli 1 and 2, 0.20 to 0.24 mm.; length of fronto-clypeo-labral area, 3.3 to 3.4 mm., width, 3.6 to 3.8 mm.; length of pronotum, 4.2 to 4.8 mm., width, 6 to 6.4 mm.

The habits of the larvae, as given by Williams and Hungerford (1913), are as follows:

They usually occur in colonies of from 2 to 11, the individual burrows being close together, often not more than $1\frac{1}{2}$ inches apart. Usually a colony can be circumscribed by a 10-inch radius. The larger ones (burrows) were a little less than one-half inch in diameter and about 39 inches deep. The rim was slightly elevated above the surface of surrounding level, and the entrance

perfectly circular. The burrows have quite a characteristic way of going straight down for about 18 inches and then, turning to an angle of about 45° downward, proceed about 18 inches farther. This lower portion has a tendency to be feebly spiral. The burrow for the last 10 or 8 inches is quite noticeably enlarged, especially laterally, and the extreme end is invariably packed with the remains of former repasts. The holes are generally located on the brow of a cliff, but one colony was found in muddy silt at the foot of a cliff-like bank, well below the recent flood level of the stream. Still others occurred on the high plain some half a mile back from the bluffs. Two or three were found that had their openings in the face of the cliff. These sloped back and did not conform to the normal burrows. It was often noticed that these larval burrows were situated near some larger hole, as that of the field mouse or badger.

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EXPLANATION OF PLATES

List of abbreviations

<i>aat</i> —anterior arm of tentorium.	<i>ge</i> —gena.
<i>ace</i> —acetabulum.	<i>gus</i> —gular suture.
<i>af</i> —angulus frontalis.	<i>h</i> —hypostoma.
<i>an</i> —antenna.	<i>hy</i> —hypopleurum.
<i>ans</i> —antennal socket.	<i>if</i> —intersegmental folds.
<i>c</i> —clypeus.	<i>ih</i> —inner hook.
<i>ca</i> —cardo.	<i>ip</i> —interpleurite.
<i>cl</i> —claw.	<i>l</i> —labium.
<i>co</i> —collum.	<i>lc</i> —latero-clypeus
<i>con</i> —condyle.	<i>lh</i> —lateral hook.
<i>cx</i> —coxa.	<i>li</i> —ligula.
<i>cxl</i> —coxal lobe.	<i>lp</i> —labial palpus.
<i>cxp</i> —coxal process.	<i>lr</i> —labrum.
<i>dat</i> —dorsal arm of tentorium.	<i>ls</i> —labio-stipites.
<i>enp</i> —entopleurum.	<i>md</i> —mandible.
<i>epl</i> —epipleurum.	<i>mds</i> —mandibular socket.
<i>eps</i> —epicranial suture.	<i>mh</i> —median hook.
<i>eso</i> —fused eusternum, sternellum, and coxal lobes.	<i>mx</i> —maxilla.
<i>esch</i> —fused eusternum, sternellum, coxal lobes, and hypopleurum.	<i>o</i> —ocellus.
<i>eust</i> —eusternum.	<i>oc</i> —occiput.
<i>f</i> —frons.	<i>ocs</i> —occipital suture.
<i>fcla</i> —fronto-clypeo-labral area.	<i>pa</i> —palpus.
<i>fe</i> —femur.	<i>pf</i> —palpifer.
<i>fs</i> —frontal suture.	<i>pg</i> —palpiger.
<i>fu</i> —furca.	<i>pge</i> —postgena.
<i>fuca</i> —furcella.	<i>pls</i> —pleural suture.
<i>ga</i> —galea.	<i>pn</i> —pronotum.
	<i>poh</i> —posthypopleurite.
	<i>postl</i> —poststernellum.

pr—prothorax.

prh—prehypopleurite.

pst—presternum.

s—spina.

sti—stipes.

stl—sternellum.

ta—tarsus.

te—tergum.

ti—tibia.

trn—trochantin.

tro—trochanter.

us—U-shaped ridge.

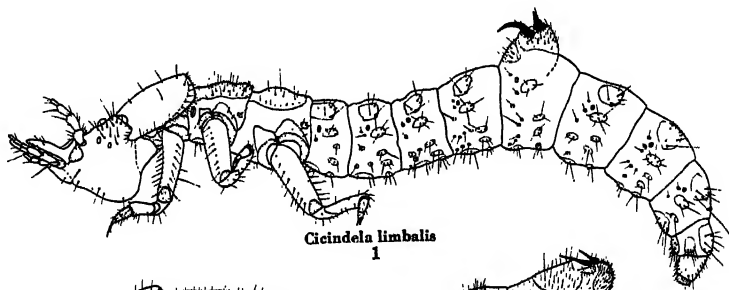
vat—ventral arm of tentorium.

ve—vertex.

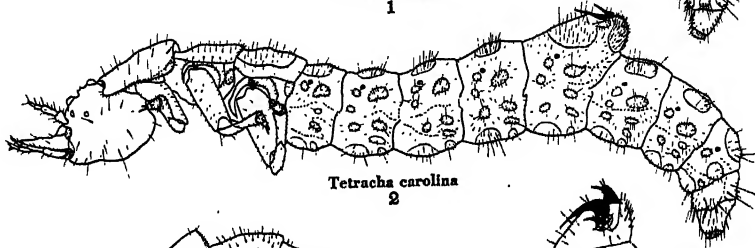
PLATE 1.

Larvae, lateral view.

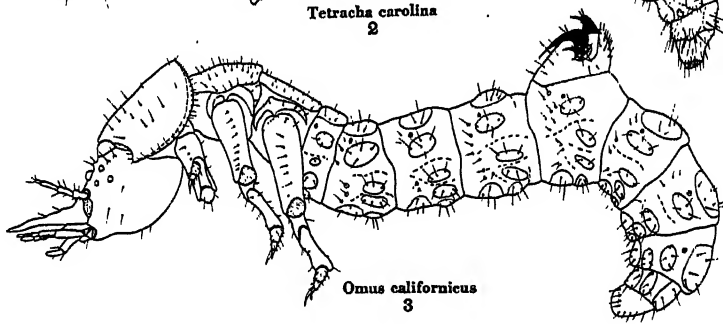
- FIG. 1.** *Cicindela limbalis*.
2. *Tetracha carolina*.
3. *Omus californicus*.
4. *Amblychila cylindriciformis*.



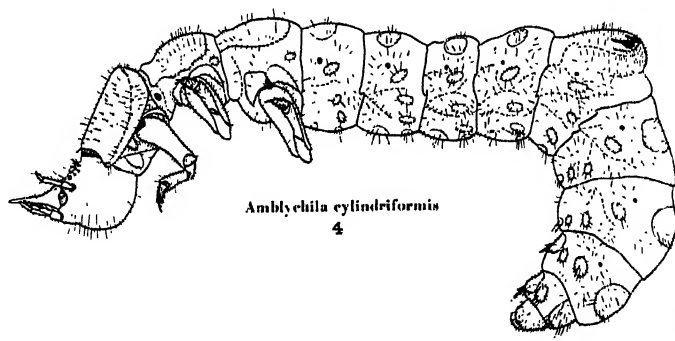
Cicindela limbalis
1



Tetracha carolina
2



Omus californicus
3

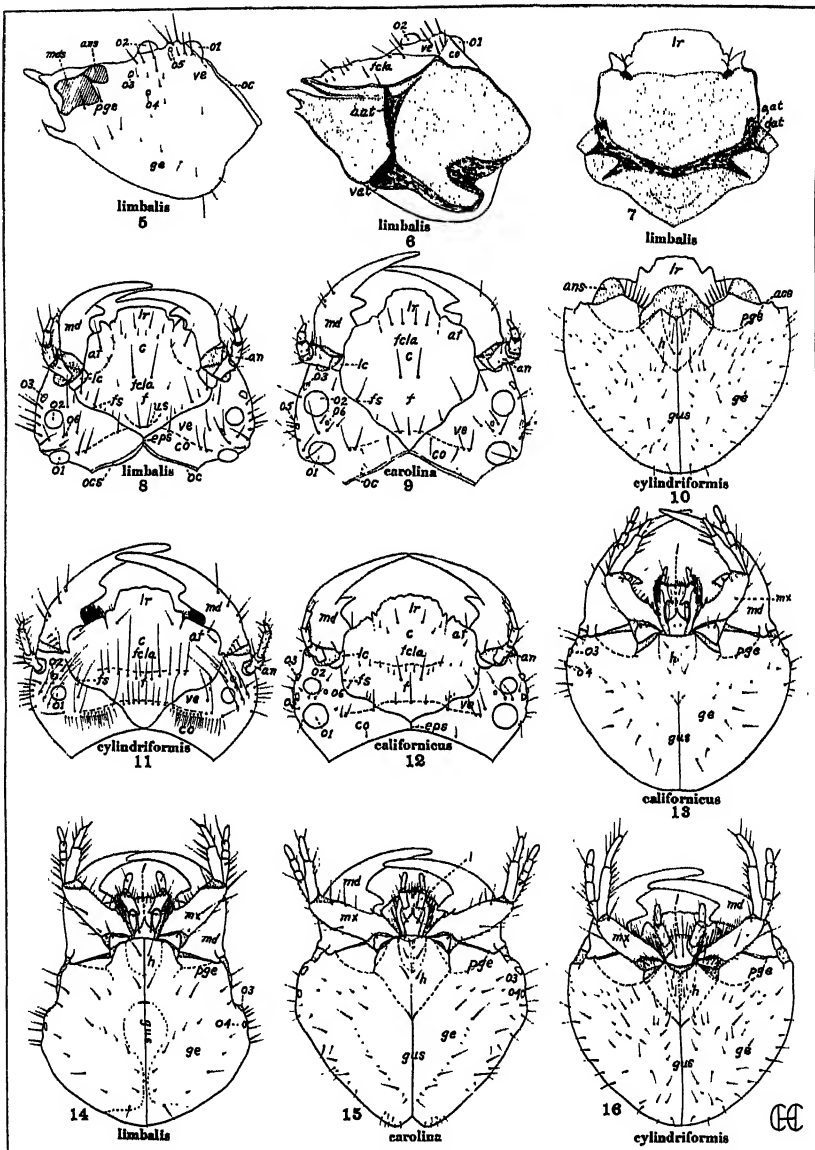


Amblychila cylindriciformis
4

CC

LATERAL VIEW OF LARVAE OF TIGER-BEETLES

FOR EXPLANATION OF PLATE SEE PAGE 74



HEADS OF VARIOUS TIGER-BEETLE LARVAE

FOR EXPLANATION OF PLATE SEE PAGE 75

PLATE 2.

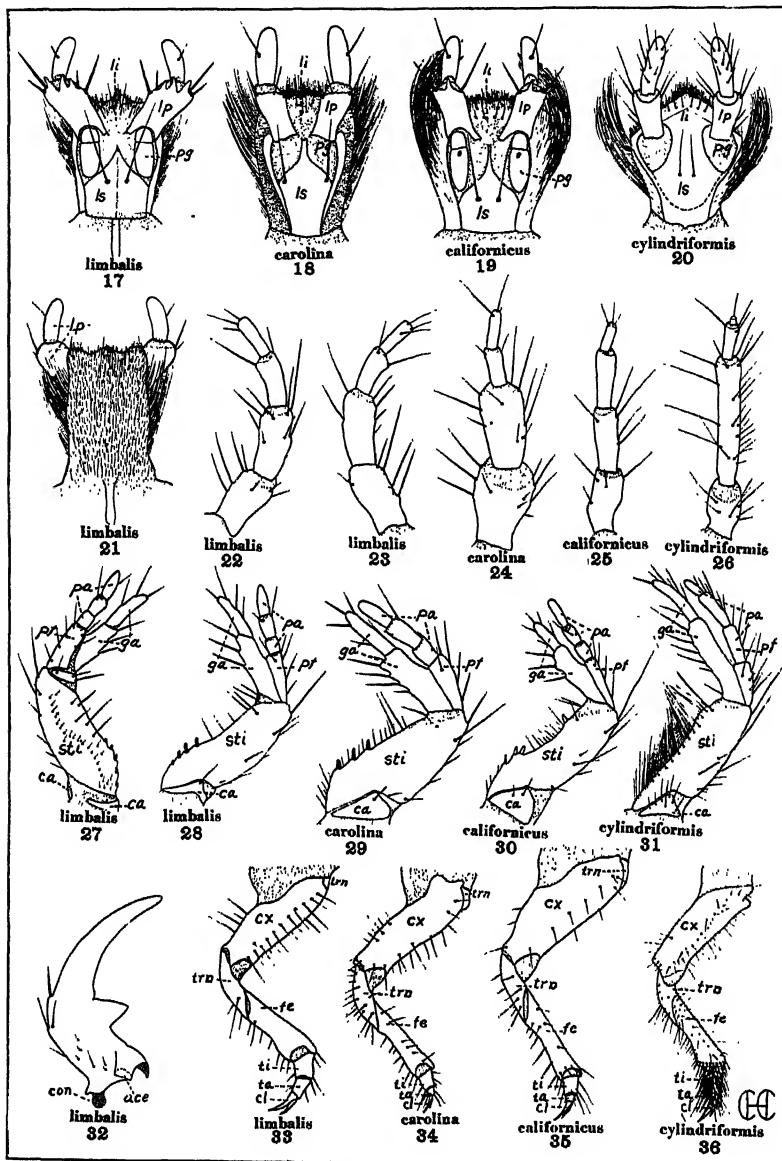
Heads.

- FIG. 5. *Cicindela limbalis*, lateral aspect, mouth-parts removed.
6. *Cicindela limbalis*, ental aspect, tentorium.
7. *Cicindela limbalis*, ental aspect.
8. *Cicindela limbalis*, dorsal aspect.
9. *Tetracha carolina*, dorsal aspect.
10. *Amblychila cylindriformis*, ventral aspect, mouth-parts removed.
11. *Amblychila cylindriformis*, dorsal aspect.
12. *Omus californicus*, dorsal aspect.
13. *Omus californicus*, ventral aspect.
14. *Cicindela limbalis*, ventral aspect.
15. *Tetracha carolina*, ventral aspect.
16. *Amblychila cylindriformis*, ventral aspect.

PLATE 3.

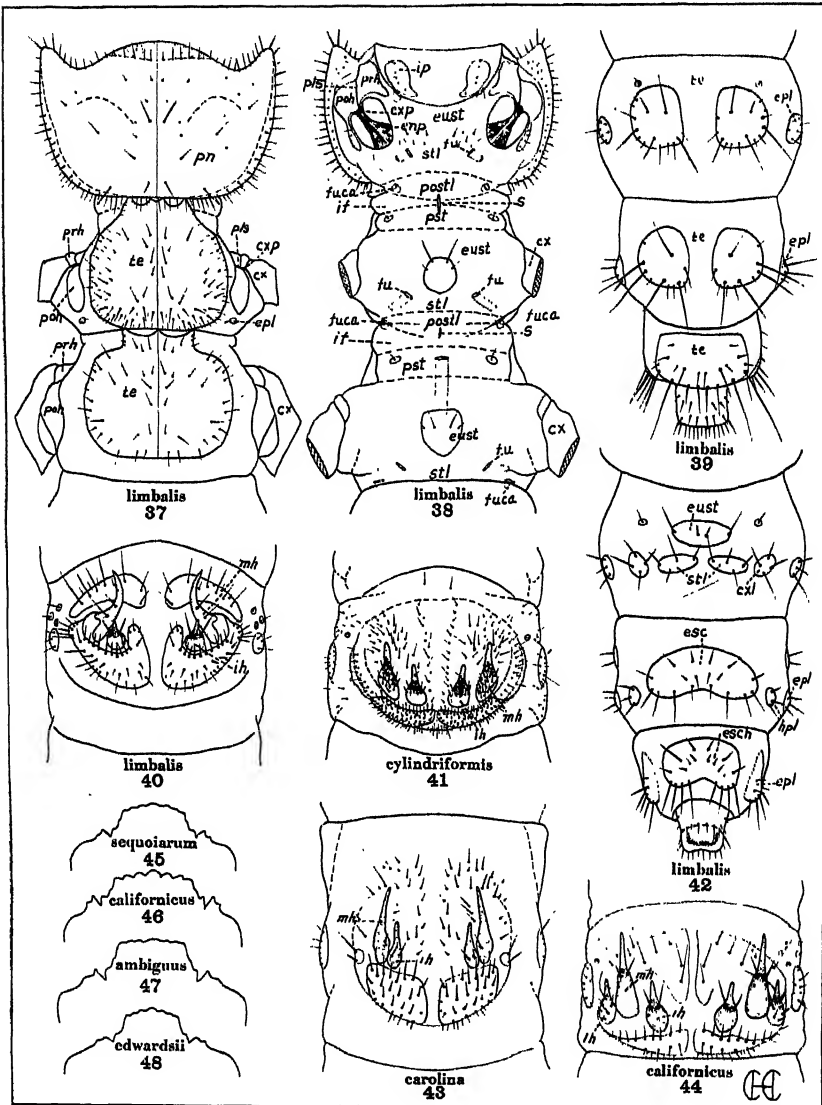
Labia, Antennae, Maxillae, and Legs.

- FIG. 17. *Cicindela limbalis*, labium, ventral aspect.
18. *Tetracha carolina*, labium, ventral aspect.
19. *Omus californicus*, labium, ventral aspect.
20. *Amblychila cylindriciformis*, labium, ventral aspect.
21. *Cicindela limbalis*, labium, dorsal aspect.
22. *Cicindela limbalis*, antenna, dorsal aspect.
23. *Cicindela limbalis*, antenna, ventral aspect.
24. *Tetracha carolina*, antenna, dorsal aspect.
25. *Omus californicus*, antenna, dorsal aspect.
26. *Amblychila cylindriciformis*, antenna, dorsal aspect.
27. *Cicindela limbalis*, maxilla, dorsal aspect.
28. *Cicindela limbalis*, maxilla, ventral aspect.
29. *Tetracha carolina*, maxilla, ventral aspect.
30. *Omus californicus*, maxilla, ventral aspect.
31. *Amblychila cylindriciformis*, maxilla, ventral aspect.
32. *Cicindela limbalis*, mandible, dorso-caudal aspect.
33. *Cicindela limbalis*, metathoracic leg., cephalic aspect.
34. *Tetracha carolina*, metathoracic leg., cephalic aspect.
35. *Omus californicus*, metathoracic leg., cephalic aspect.
36. *Amblychila cylindriciformis*, metathoracic leg., cephalic aspect.



LABIA, ANTENNAE, MAXILLAE, AND LEGS OF TIGER-BEETLE LARVAE

FOR EXPLANATION OF PLATE SEE PAGE 76



LABRA, THORACES, AND ABDOMINA OF TIGER-BEETLE LARVAE

FOR EXPLANATION OF PLATE SEE PAGE 77

PLATE 4.

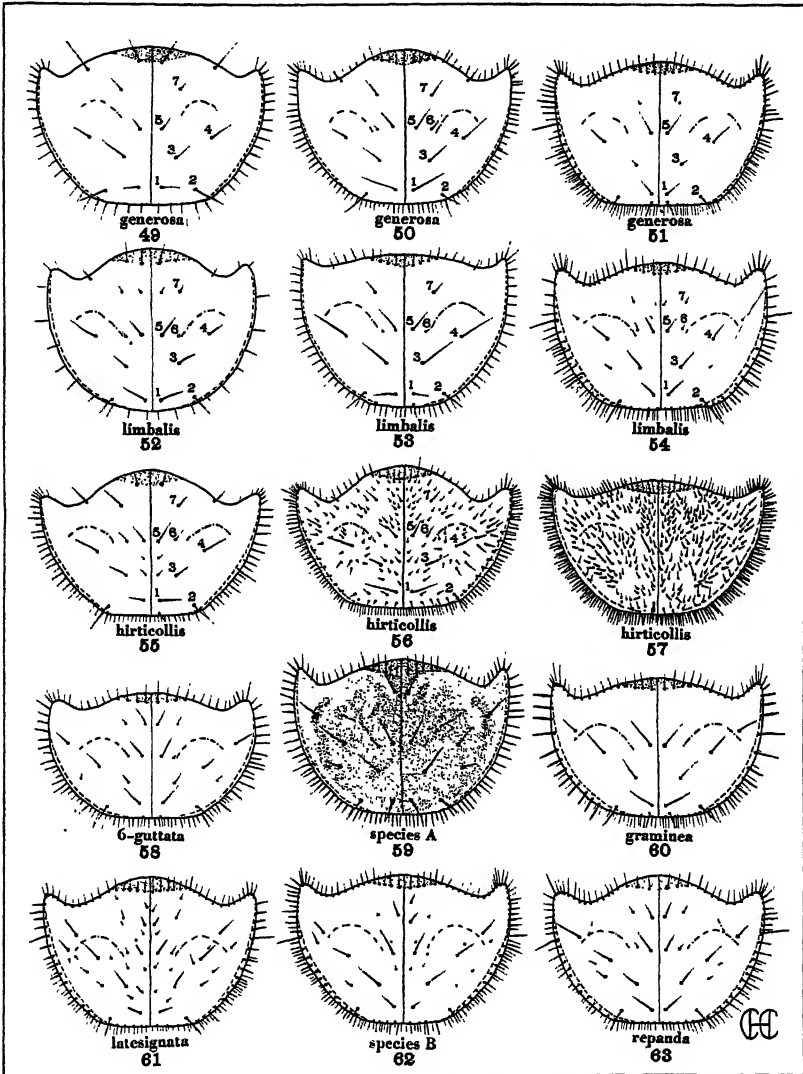
Labra, Thoraces, and Abdomina.

- FIG. 37. *Cicindela limbalis*, thorax, dorsal aspect.
38. *Cicindela limbalis*, thorax, ventral aspect.
39. *Cicindela limbalis*, abdomen, dorsal aspect, segments seven to ten.
40. *Cicindela limbalis*, fifth abdominal segment.
41. *Amblychila cylindriciformis*, fifth abdominal segment.
42. *Cicindela limbalis*, abdomen, ventral aspect, segments seven to ten.
43. *Tetracha carolina*, fifth abdominal segment.
44. *Omus californicus*, fifth abdominal segment.
45. *Omus sequoiarum*, labrum, cephalic margin.
46. *Omus californicus*, labrum, cephalic margin.
47. *Omus ambiguus*, labrum, cephalic margin.
48. *Omus edwardsii*, labrum, cephalic margin.

PLATE 5.

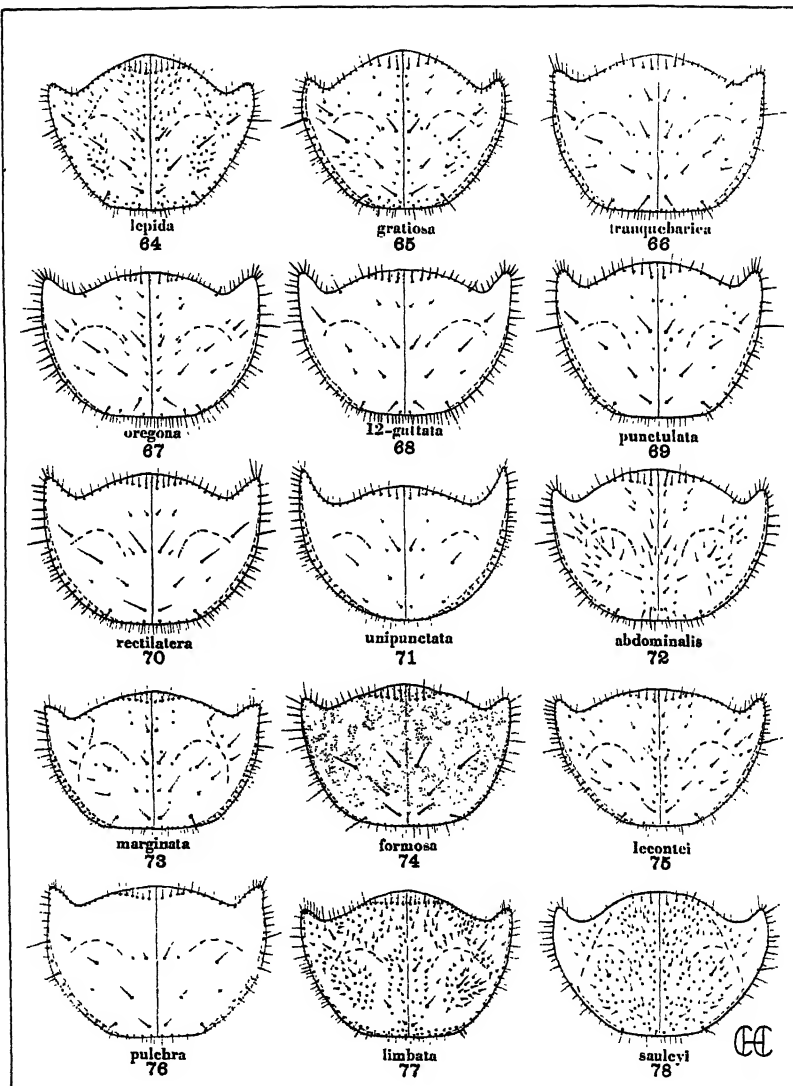
Pronota, Setal Plans.

- FIG. 49. *Cicindela formosa*, var. *generosa*, first instar.
50. *Cicindela formosa*, var. *generosa*, second instar.
51. *Cicindela formosa*, var. *generosa*, third instar.
52. *Cicindela limbalis*, first instar.
53. *Cicindela limbalis*, second instar.
54. *Cicindela limbalis*, third instar.
55. *Cicindela hirticollis*, first instar.
56. *Cicindela hirticollis*, second instar.
57. *Cicindela hirticollis*, third instar.
58. *Cicindela 6-guttata*, third instar.
59. *Cicindela*, species A, third instar.
60. *Cicindela purpurea*, var. *graminea*, third instar.
61. *Cicindela latesignata*, third instar.
62. *Cicindela*, species B, third instar.
63. *Cicindela repanda*, third instar.



PRONOTA AND SETAL PLANS OF TIGER-BEETLE LARVAE

FOR EXPLANATION OF PLATE SEE PAGE 78



PROCTA AND SETAL PLANS OF TIGER-BEETLE LARVAE

FOR EXPLANATION OF PLATE SEE PAGE 79

PLATE 6.

Pronota, Setal Plans.

- FIG. 64. *Cicindela lepida*, third instar.
65. *Cicindela gratiosa*, third instar.
66. *Cicindela tranquebarica*, third instar.
67. *Cicindela oregona*, third instar.
68. *Cicindela 12-guttata*, third instar.
69. *Cicindela punctulata*, third instar.
70. *Cicindela flavopunctata*, var. *rectilatera*, third instar.
71. *Cicindela unipunctata*, third instar.
72. *Cicindela abdominalis*, third instar.
73. *Cicindela marginata*, third instar.
74. *Cicindela formosa*, third instar.
75. *Cicindela scutellaris*, var. *lecontei*, third instar.
76. *Cicindela pulchra*, third instar.
77. *Cicindela limbata*, third instar.
78. *Cicindela dorsalis*, var. *sauleyi*, third instar.

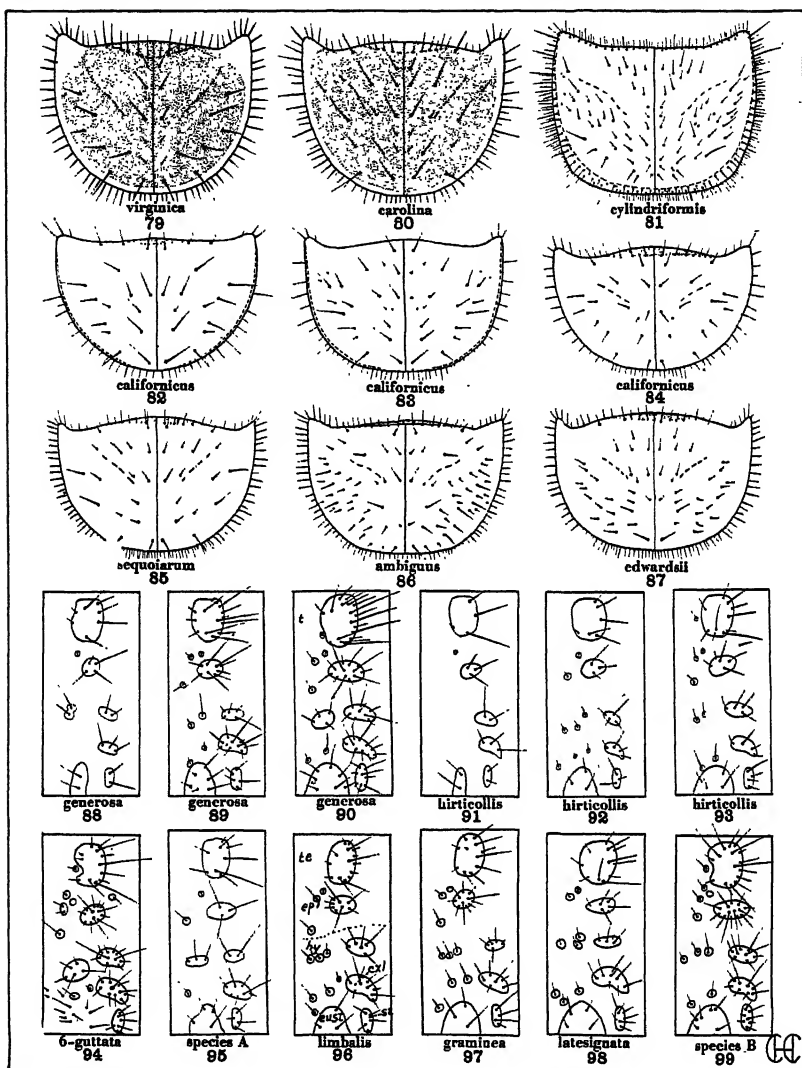
PLATE 7.

Pronota, Setal Plans.

- FIG. 79. *Tetracha virginica*, third instar.
80. *Tetracha carolina*, third instar.
81. *Amblychila cylindriciformis*, third instar.
82. *Omus californicus*, first instar.
83. *Omus californicus*, second instar.
84. *Omus californicus*, third instar.
85. *Omus sequoiarum*, third instar.
86. *Omus ambiguus*, third instar.
87. *Omus edwardsii*, third instar.

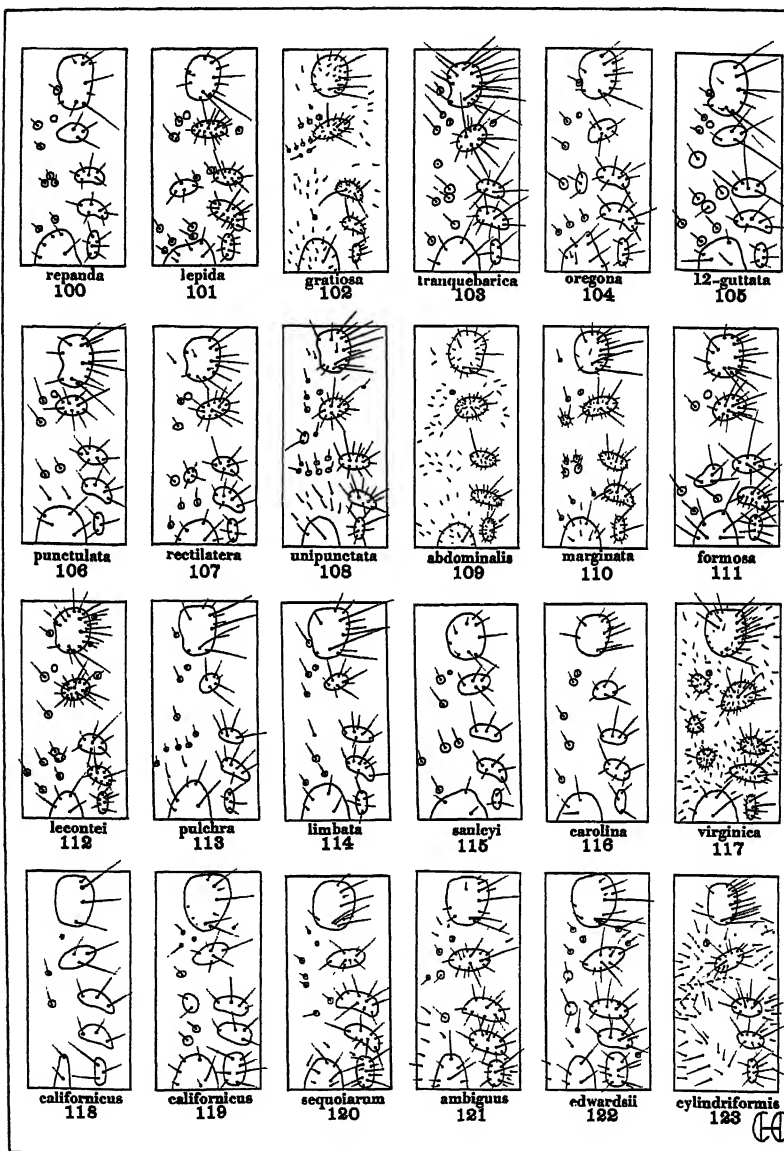
Third Abdominal Segments, Setal Plans.

- FIG. 88. *Cicindela formosa*, var. *generosa*, first instar.
89. *Cicindela formosa*, var. *generosa*, second instar.
90. *Cicindela formosa*, var. *generosa*, third instar.
91. *Cicindela hirticollis*, first instar.
92. *Cicindela hirticollis*, second instar.
93. *Cicindela hirticollis*, third instar.
94. *Cicindela 6-guttata*, third instar.
95. *Cicindela*, species A, third instar.
96. *Cicindela limbata*, third instar.
97. *Cicindela purpurea*, var. *graminea*, third instar.
98. *Cicindela latesignata*, third instar.
99. *Cicindela*, species B, third instar.



PRONOTA, SETAL PLANS, AND ABDOMINAL SEGMENTS OF TIGER-BEETLE LARVAE

FOR EXPLANATION OF PLATE SEE PAGE 80



THIRD ABDOMINAL SEGMENTS AND SETAL PLANS OF TIGER-BEETLE LARVAE

FOR EXPLANATION OF PLATE SEE PAGE 81

PLATE 8.

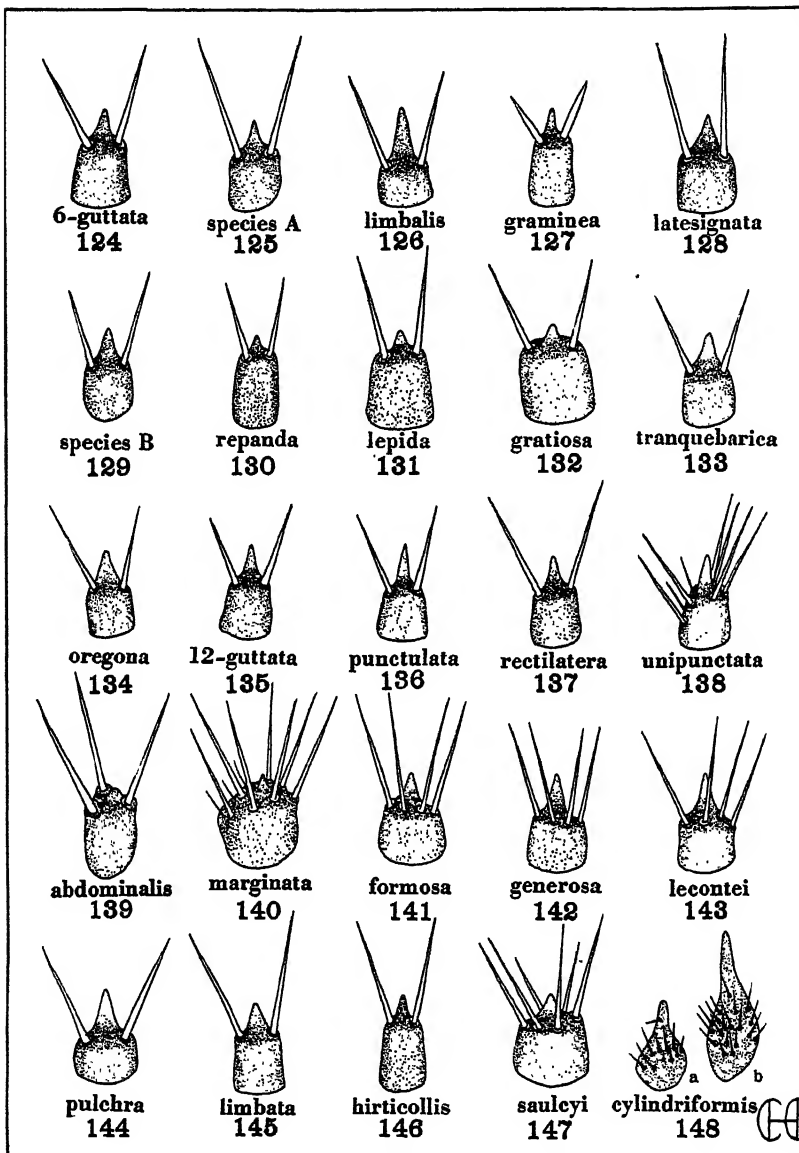
Third Abdominal Segments, Setal Plans.

- FIG. 100. *Cicindela repanda*, third instar.
101. *Cicindela lepida*, third instar.
102. *Cicindela gratiosa*, third instar.
103. *Cicindela trangebarica*, third instar.
104. *Cicindela oregona*, third instar.
105. *Cicindela 12-guttata*, third instar.
106. *Cicindela punctulata*, third instar.
107. *Cicindela flavopunctata*, var. *rectilatera*, third instar.
108. *Cicindela unipunctata*, third instar.
109. *Cicindela abdominalis*, third instar.
110. *Cicindela marginata*, third instar.
111. *Cicindela formosa*, third instar.
112. *Cicindela scutellaris*, var. *lecontei*, third instar.
113. *Cicindela pulchra*, third instar.
114. *Cicindela limbata*, third instar.
115. *Cicindela dorsalis*, var. *sauleyi*, third instar.
116. *Tetracha carolina*, third instar.
117. *Tetracha virginica*, third instar.
118. *Omus californicus*, first instar.
119. *Omus californicus*, third instar.
120. *Omus sequoiarum*, third instar.
121. *Omus ambiguus*, third instar.
122. *Omus edwardsii*, third instar.
123. *Amblychila cylindriciformis*, third instar.

PLATE 9.

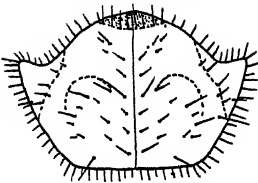
Inner Hooks.

- FIG. 124. *Cicindela 6-guttata*.
125. *Cicindela*, species A.
126. *Cicindela limbalis*.
127. *Cicindela purpurea*, var. *graminea*.
128. *Cicindela latesignata*.
129. *Cicindela*, species B.
130. *Cicindela repanda*.
131. *Cicindela lepida*.
132. *Cicindela gratiosa*.
133. *Cicindela tranquebarica*.
134. *Cicindela oregona*.
135. *Cicindela 12-guttata*.
136. *Cicindela punctulata*.
137. *Cicindela flavopunctata*, var. *rectilatera*.
138. *Cicindela unipunctata*.
139. *Cicindela abdominalis*.
140. *Cicindela marginata*.
141. *Cicindela formosa*.
142. *Cicindela formosa*, var. *generosa*.
143. *Cicindela scutellaris*, var. *lecontei*.
144. *Cicindela pulchra*.
145. *Cicindela limbata*.
146. *Cicindela hirticollis*.
147. *Cicindela dorsalis*, var. *sauleyi*.
148. *Amblychila cylindriciformis*; a, mesal hook; b, median hook

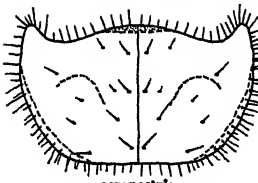


INNER HOOKS OF TIGER-BEETLE LARVAE

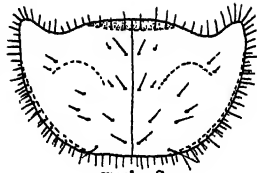
FOR EXPLANATION OF PLATE SEE PAGE 82



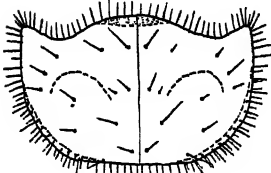
biramosa
149



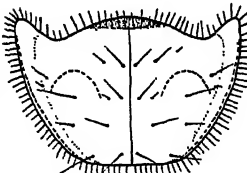
campestris
150



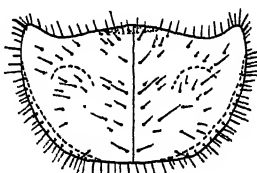
species C
151



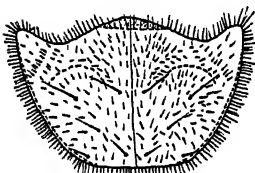
species D
152



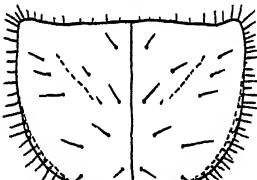
euprasceus macra
153



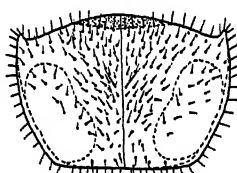
hybrida
154



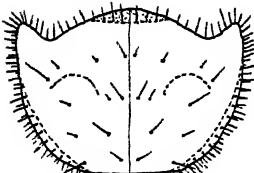
hybrida maritima
155



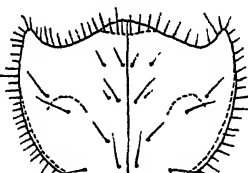
euphratica
156



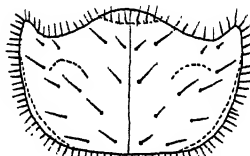
Ctenostoma ?
157



obsoleta
158



silvicola
159



germanica
160

CC

PRONTA AND SETAL PLANS OF TIGER-BEETLE LARVAE

FOR EXPLANATION OF PLATE SEE PAGE 83

PLATE 10.

Pronta, setal plans of third instar.

- FIG. 149. *Cicindela biramosa*.
150. *Cicindela campestris*.
151. *Cicindela*, species C.
152. *Cicindela*, species D.
153. *Cicindela cuprascens macra*.
154. *Cicindela hybrida*.
155. *Cicindela hybrida maritima*.
156. *Tetracha eupratICA*.
157. *Otenostoma* (?) species.
158. *Cicindela obsoleta*.
159. *Cicindela silvicola*.
160. *Cicindela germanica*.

PLATE 11.

Third abdominal segments, setal plans.

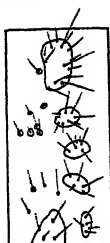
- FIG. 161. *Cicindela biramosa*.
162. *Cicindela campestris*.
163. *Cicindela*, species C.
164. *Cicindela*, species D.
165. *Cicindela cuprascens macra*.
166. *Cicindela hybrida*.
167. *Cicindela hybrida maritima*.
168. *Tetracha eupratICA*.
169. *Cicindela obsoleta*.
170. *Cicindela silvicola*.
171. *Cicindela germanica*.

Right inner hooks.

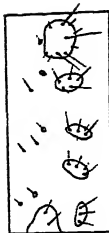
- FIG. 172. *Cicindela cuprascens macra*.
173. *Cicindela biramosa*.
174. *Cicindela campestris*.
175. *Cicindela*, species C.
176. *Cicindela hybrida maritima*.
177. *Cicindela hybrida*.
178. *Cicindela*, species D.
179. *Cicindela obsoleta*.
180. *Cicindela silvicola*.
181. *Cicindela germanica*.
182. *Ctenostoma* (?) species, dorsal aspect of head.
183. *Ctenostoma* (?) species, ventral aspect of eighth, ninth, and tenth abdominal segments.
184. *Ctenostoma* (?) species, dorsal aspect of fifth abdominal segment.



biramosa
161



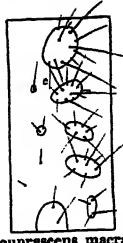
campestris
162



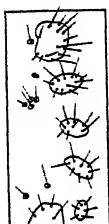
species C
163



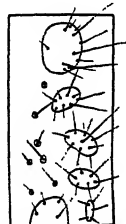
species D
164



cuprascens macra
165



hybrida
166



hybrida maritima
167



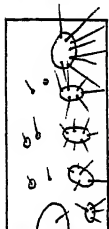
euphratica
168



obsoleta
169



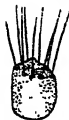
silvicola
170



germanica
171



cuprascens macra
172



biramosa
173



campestris
174



species C
175



hybrida maritima
176



hybrida
177



species D
178



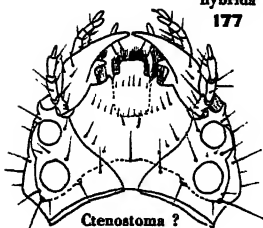
obsoleta
179



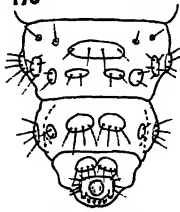
silvicola
180



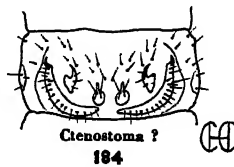
germanica
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Ctenostoma ?
182



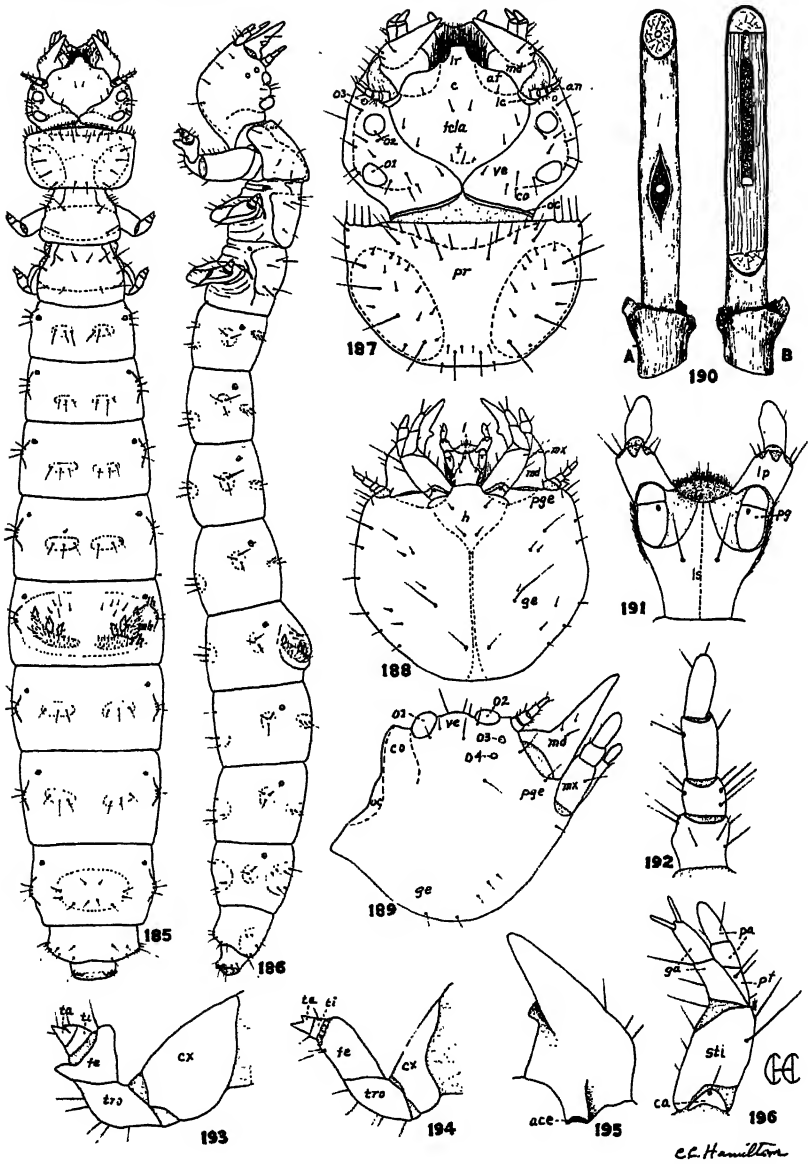
Ctenostoma ?
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Ctenostoma ?
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THIRD ABDOMINAL SEGMENTS AND SETAL PLANS OF TIGER-BEETLE LARVAE

FOR EXPLANATION OF PLATE SEE PAGE 84



COLLYRIS, SPECIES EMARGINATUS DEJEAN OR BONELLII GUÉRIN

FOR EXPLANATION OF PLATE SEE PAGE 85

PLATE 12.

Collyris, species *emarginatus* Dejean or *Bonellii* Guérin.

- FIG. 185. Larva, dorsal aspect.
186. Larva, lateral aspect.
187. Head and pronotum, dorsal aspect.
188. Head, ventral aspect.
189. Head, lateral aspect.
190. Twigs of coffee plant; *a.* Showing the opening to the exterior.
Portion of the twig cut away showing the burrow in the pith.
191. Labium, ventral aspect.
192. Antenna.
193. Right prothoracic leg, cephalic aspect.
194. Left metathoracic leg, caudal aspect.
195. Right mandible, dorsal aspect.
196. Left maxilla, ventral aspect.

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NOTES ON ENTOMOSTRACA FROM COLORADO.
THE SHANTZ COLLECTIONS FROM THE PIKES PEAK REGION.

G. S. DODDS,
Of West Virginia University.

The collections of entomostraca described in this paper were made by Dr. H. L. Shantz, mainly during the summers of 1903 and 1904. He made them the basis of a paper,¹ in which he gives a full description of the lakes, together with notes on various features of their fauna and flora. Full determination of the species of entomostraca in the collections were not, however, included in that paper. The collections have since been turned over to the United States National Museum, and at the request of the curator of marine invertebrates I have made determinations of the species. A number of the vials of the lot had dried, but there remained 169 vials of material in good condition, most of which contained entomostraca.

These collections are from two groups of lakes, one including nine bodies of water near timber line on the slopes of Pikes Peak, at elevations of 3,110 to 3,626 meters (10,200 to 11,890 feet) above sea level, the other 14 lakes and ponds on the plains, near Colorado Springs, just at the eastern base of Pikes Peak, at elevations of 1,800 to 2,203 meters (5,969 to 7,225 feet). It should also be noted that five of the lakes in the higher group were described by Ward ² in 1904, the paper including a list of 13 species of entomostraca. This paper and the one by Shantz describe the region and the lakes so well that no further notes are needed in the present paper. The collections of Shantz should also be considered in connection with findings of the author in studies of entomostraca from both mountains and plains of Colorado, mainly from collections from the region of Boulder and Tolland, Colorado, about 65 miles north of Pikes Peak.³

Thirty-one species of entomostraca have been identified from the collections of Shantz, distributed as follows: Phyllopoda 1, Cladocera 19, Copepoda 11 species. For a detailed list of the species collected in each lake see Table 1. Three of these species have not previously been reported from Colorado, *Diphanosoma brachyurum*, *Ceriodaphnia*

¹ Shantz, H. L. A Biological Study of the Lakes of the Pikes Peak Region, Trans. Amer. Micros. Soc., vol. 27, pp. 75-98, with three plates, 1907.

² Ward, Henry B. A Biological Reconnaissance of some Elevated Lakes of the Sierras and the Rockies, Trans. Amer. Micros. Soc., vol. 25, pp. 127-154, with 12 plates.

³ Dodds, G. S. Descriptions of Two New Species of Entomostraca from Colorado, with Notes on Other Species, Proc. U. S. Nat. Mus., vol. 49, pp. 97-102, 1915; Altitudinal Distribution of Entomostraca in Colorado, Proc. U. S. Nat. Mus., vol. 54, pp. 58-87, 1917; Entomostraca and Life Zones, Biol. Bull., vol. 39, pp. 89-107, 1920.

quadrangula, and *Diaptomus washingtonensis*. The finding of *Diaptomus washingtonensis* here, at the eastern base of the Rocky Mountains, is of interest. The species was described by Marsh from material collected at Walla Walla, Washington, and its occurrence here is a long extension of range for a species of this genus, which is one composed of many species, most of which have rather limited range. It makes up an important part of the fauna of six lakes on the plains, but is not found in any of those in the mountains. There seems to be no doubt about the identification, as it bears all the marks by which Doctor Marsh distinguished it from *D. signicauda*, and agrees well with his figures and descriptions of material from the State of Washington.

The State of Colorado includes an area that has a far greater biological significance than might be expected of a mere political area. Situated as it is, astride the Continental Divide, it includes the highest portion of the Rockies, is the meeting place of eastern and western faunas, includes lowland areas of both the Great Plains and the Great Basin, and in its higher areas includes southern extensions of high northern faunas. It is thus a meeting place for faunas which under ordinary conditions are separated by hundreds of miles. The State includes portions of five life zones—Upper Sonoran, Transition, Canadian, Hudsonian, and Arctic-alpine. The collections of Shantz are of interest because they include a section through all of these zones with the very different climatic conditions prevailing at the extremes. It was with these conditions in mind that Shantz selected these lakes for study, as clearly indicated in the opening paragraph of his paper:

Here, within a few miles of each other, are two groups of lakes representing quite different types, the alpine and those of the plains. The alpine lakes lie far up on the mountains, * * * with typical alpine surroundings. The plains lakes lie on the western edge of the Great Plains, * * * with conditions which are in no wise alpine. They are lowland lakes.

The species in these collections take on their greatest significance when considered in connection with the above facts, especially when considered in connection with my own collections from the Tolland region. It is hoped that the frequent reference to my own collections are made in such a way as to emphasize the importance of those made by Shantz, which, though made several years before I had done any collecting, unfortunately, were not determined, and so were deprived of the priority of notice to which they were entitled. Though they do not include by any means as many lakes as do mine, had they been studied soon after they were made they would have anticipated many of the facts presented in my earlier papers.

The species in these collections, just as did those from my own collections, fall into three natural groups, (1) 13 species found on the plains but not extending into the mountains, (2) 9 species found only

in the mountains, and (3) 9 species found in both groups of lakes. The third group includes the euthermic species, those which are able to live in both warm and cold water, while the first and second

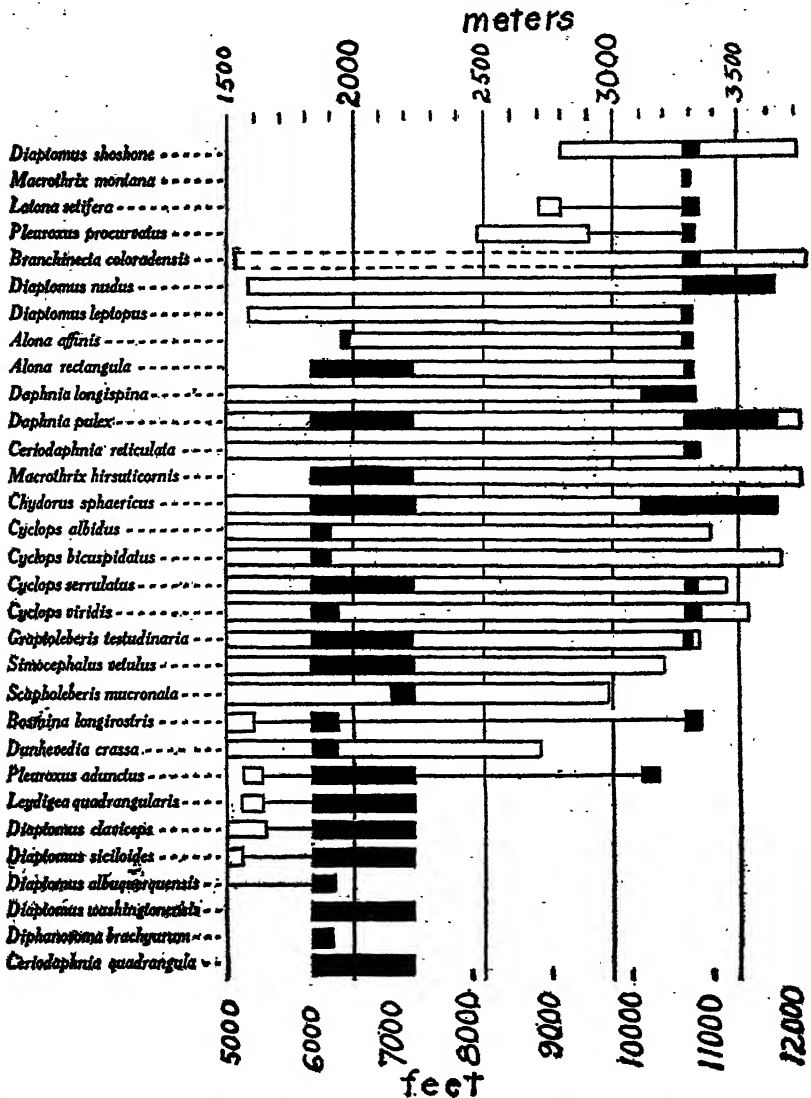


FIG. 1.—GRAPHIC REPRESENTATION OF ALTITUDINAL RANGE OF THE SPECIES OF ENTOMOSTRACA COLLECTED BY H. L. SHANTZ IN THE PIKE'S PEAK REGION. THE SOLID BLACK PART OF EACH BAR REPRESENTS THE RANGE OF ALTITUDE COVERED BY THE PRESENT COLLECTIONS, THE OPEN PART THE EXTENSIONS OF RANGE BY MAKING USE OF ALL OTHER RECORDS FROM THE STATE OF COLORADO.

groups are composed of stenothermic species, which are more narrowly limited to water of about the same temperature, the one group to colder waters, the other to warmer. These three groups are clearly shown in Figure 1. The significance of these records becomes

more apparent when we remember that these two groups of lakes are separated by but a few miles, the extremes of the two being separated by not more than 10 miles. Yet the two groups support entomostracan faunas quite distinct from each other, as distinct as if separated by hundreds of miles in a north and south direction, a fact which emphasizes the importance of an altitudinal difference of a little more than a thousand meters. It is commonly recognized that the entomostraca are a group in which dispersal is easy, as indicated by the cosmopolitan distribution of some species and the wide range of nearly all genera. Yet here, close together, we find two groups of lakes in each of which there are several species which are not found in the other. The several species common to the two groups stand in strong contrast to the others and serve to emphasize the fact that temperature may be an effective barrier for some species but not for others.

The zonal distribution of the species in these collections agrees well with that of the same species as found in the Tolland region. In a few instances the Shantz collections have served to extend the range of species into altitudes in which they had not previously been collected in the Colorado region, and in others they fail to give certain species as wide a range as assigned to them on the basis of collections in various other parts of the State. This, however, is not surprising. The gratifying thing is the large extent of the agreement, and the few differences are not surprising in view of the relatively small amount of the work that has been done in this as well as in other parts of the State. It is of interest to remember, also, that the lakes on the plains are artificial, that the oldest was only 28 years old at the time Shantz made his collections, and that most of them are far younger than that, and that even the youngest of them had an abundant entomostracan fauna (as Mesa No. 3, which was only 1 year old and yet yielded eight species).

The lakes of the higher group fall into two divisions on the basis of their fauna, and these two divisions have an altitudinal significance. Dead Lake, which falls within the Hudsonian or upper part of the Canadian zone, typifies the highest division and agrees well with the 43 lakes and ponds in the Tolland region assigned to the Alpine Zone (Dodds '17). In the 22 vials of material from this lake there were 11 species. By far the most abundant among them were *Daphnia pulex* and *Diaptomus shoshone*, the two species which characterize the highest lakes of the Tolland region. *Branchinecta coloradensis*, another typically alpine form,⁴ is also present. Certain

⁴Shantz, H. L. Notes on the North American Species of *Branchinecta* and their Habits, Biol. Bull., vol. 9, pp. 249-264, 1905.

Branchinecta coloradensis has been considered an exclusively alpine species, but if the record as determined by the author from a collection sent him from St. Vrain, Colorado, at 1,525 meters (5,000 feet), May 30, 1912, be correct, our notions on this must be revised. The author invites comment on this and would be glad of additional material bearing on this point. (See Dodds '17, p. 77.)

of the other species from this lake have also a significance as belonging to mountain lakes, but none of them are definitely related to the alpine zone as distinct from other mountain elevations. Bald Mountain Lake, 52 meters above timber line, doubtless also belongs to the alpine zone, but its fauna, as represented in the collections, is too scant to be of significance, except for the presence of *Daphnia pulex*.

Michigan Lake, 288 meters below timber line, while at nearly the same elevation as Dead Lake, has a decidedly different fauna, one which relates it to a lower zone in agreement with the 63 lakes of the Tolland region assigned to the Montane (probably Canadian) zone. In this lake are found as the dominant species *Daphnia longispina* and *Diaptomus leptopus*, var. *piscinae* in place of the two species of these genera found in Dead Lake. In two other lakes, Heart and Fish, this is also the case, while in Ribbon Lake these two species are also very abundant with a few individuals of *Daphnia pulex* in one of the collections. It has been shown clearly in the Tolland region that *Diaptomus shoshone* belongs to a higher group of lakes than does *D. leptopus*, var. *piscinae*, and though no very definite altitudinal difference is apparent in the Pike's Peak group, probably because the number of lakes is few and they are at not greatly differing altitudes, it is quite probable that the same significance attaches to these two species here as in the Tolland region. In making studies of altitudinal zonation it is a striking fact that local conditions often change the biotic conditions, so that zonal boundaries are ragged. In the Tolland region, while the two species of *Diaptomus* did unquestionably belong to two different altitudinal regions, there were a few scattered lakes containing *D. shoshone* well within the area occupied in the main by *D. leptopus*. It was also a striking fact in the Tolland region that in mountain lakes where *Diaptomus shoshone* was present the species of *Daphnia* present was *pulex*, and that when *Diaptomus leptopus* was present, *Daphnia longispina* rather than *pulex* was present. In hardly any instance were both species of *Diaptomus* found in the same lake nor both species of *Daphnia*. The collections of Shantz show the same relations to exist in the Pike's Peak lakes between these four species. They have been selected as "zone indicators" because when present in a lake they are usually there in considerable numbers and because they appear to give a consistent separation between zones.

Other species of significance in the mountain group of lakes, as belonging to mountain rather than to lowland lakes, though not of use in differentiating between the zones within the mountains, are *Macrothrix montana* (described by Birge from Pike's Peak material and so far not reported from other localities), *Latona setifera*, *Pleuroxus procurvatus*, and *Diaptomus nudus*, which belong to the colder zones,

either in northern latitudes or in higher elevations of more southern regions.

The lakes on the plains, as previously mentioned, have several species in common with those in the mountains, but they lack those just mentioned as belonging especially to the mountains. In addition they have several species which do not extend into the mountains at all, but are common forms in lowland lakes. Conspicuous among these are four species of *Diaptomus*, which, both on account of their size and their numbers, constitute an important part of the entomostracan fauna. *Diaptomus claviceps* and *D. washingtonensis* are found in abundance in five lakes, while *D. siciloides* and *D. albuquerqueensis* are plenty in certain others. It would be of interest to have collections from other lakes in this region to determine whether these four species are commonly associated in these two groups, and if possible to determine the underlying conditions. *Daphnia pulex* is commonly present in these lakes, but *D. longispina* was not collected, the findings again agreeing with common conditions in the plains portion of the State. The other species do not call for special comment.

In regard to amount of entomostracan life, there is some advantage, though not great, with the lakes on the plains. The mountain lakes are by no means scant in species or in individuals, nor is the size of the individuals less than in the warmer lakes. I have made no attempt to compare in detail the fauna of the different lakes. Points of interest might appear in such a study, but it appears that the greatest interest of these collections is their relation to altitudinal zonation and their bearing upon this problem as it has been studied at other points in the same general region.

NEW NORTH AMERICAN SPECIES OF BEES BELONGING TO THE GENUS HALICTUS (CHLORALICTUS).

By GRACE ADELBERT SANDHOUSE,
of the University of Colorado, Boulder.

INTRODUCTION.

Since the name *Chloralictus* was suggested by Robertson in 1902 for certain of the metallic-colored Halictine bees, many interesting new species have been added to this subgenus. The Rocky Mountain States, with their very diverse habitats, have yielded a majority of the species, and still continue to yield many species. Through the efforts of Robertson considerable knowledge of the *Chloralicti* of Illinois has been given us, and the *Chloralictus* fauna of the east-central States seems to be quite like that of Illinois. The number of species reported from the Southern States has been remarkably small, a few having been recorded from Florida. In the Pacific States, California has yielded several very interesting species.

In the collection of Prof. T. D. A. Cockerell, of the University of Colorado, is a number of *Chloralictus*—both male and females—from widely separated localities. During the last year the writer has been privileged to work up this collection under the supervision of Professor Cockerell. The result has been an unusually large number of new species. In very few cases were there representatives of the two sexes from one locality; or, if so represented, the differences between the sexes were so great that it was not considered advisable to attempt to match them until further data were obtained. Keys have been compiled for all of the species represented in Professor Cockerell's collection as well as the new species, but it was not found practicable to include in these key species known only from descriptions.

KEY TO FEMALES OF HALICTUS (CHLORALICTUS).¹

Comparatively large, anterior wing at least 6 mm. long; wings somewhat dusky, except in <i>connexus</i>	1
Smaller species, usually with paler wings	9
1. Abdomen blue or green	2
Abdomen black	4

¹ See second paragraph of introduction for statement of species included in this key.

2. Mesothorax dark blue, coarsely granular (Costa Rica)..... sudus Vachal. 3
 Mesothorax green 3
3. Mesothorax shining olive green, with scattered punctures.... aquilae Cockerell. 3
 Mesothorax brassy green, closely punctured (Colorado)... olivarius, new species.
4. Head and thorax dark blue or blue-green 5
 Head and thorax largely green; no blue tints 6
5. Mesothorax dullish, with rather close punctures; disk of propodeum with
 plicae largely confined to the basal part (New Mexico)..... euryceps Ellis
 Mesothorax somewhat shining, more sparsely punctured; disk of propodeum
 rugose (Massachusetts) nigroviridis Graenicher.
6. Mesothorax rugoso-punctate (Iowa) bruneri Crawford. 7
 Mesothorax distinctly punctured 7
7. Mesothorax with small close punctures; disk of propodeum with somewhat
 discontinuous rugae (Colorado) zophops Ellis.
 Mesothorax coarsely punctured (Eastern States)..... 8
8. Wings clear; disk of propodeum brassy green, crescentic, plicate.
 connexus Cresson.
 (Tegulae and wings reddish)..... subconnexus Ellis.
 Wings not clear; tegulae dark; disk of propodeum blue, strongly rugose.
 nymphaearum Robertson.
9. Cheeks with a large tubercle below; head large; abdomen with greenish
 luster (New Mexico) oleosus Cockerell.
 Cheeks not thus tuberculate 10
10. Small species with punctured tegulae 11
 Tegulae not thus punctured..... 15
11. Wings clear; stigma pale; head and thorax blue-green 12
 Wings somewhat dusky; head and thorax green, sometimes brassy 13
12. Tegulae truncate posteriorly; disk of propodeum with irregularly anasto-
 mosing rugae (Illinois)..... regularis Robertson.
 Tegulae pointed posteriorly; disk of propodeum granular (New Mexico).
 regulariformis Crawford.
13. Mesothorax green; disk of propodeum plicate (Massachusetts).
 calisiae, new species.
14. Mesothorax often brassy or coppery; disk of propodeum not plicate 14
 Mesothorax brassy with purplish reflections; tegulae strongly punctured; disk
 of propodeum long with radiating rugae..... perparvus Ellis.
 Mesothorax golden green; disk of propodeum short, granular; tegulae deli-
 cately punctured..... pseudotegularis Cockerell.
 Mesothorax very dark olive green; disk of propodeum long, granular; tegulae
 strongly punctured (California)..... hellanthi Cockerell.
15. Abdomen largely blue or green..... 16
 Abdomen red 30
 Abdomen black or brown..... 43
16. Brilliant steel blue species; wings somewhat dusky; stigma dark (Illinois).
 coerulesus Robertson. 17
 Not so colored 17
17. Wings white, very clear; stigma honey color; pubescence pure white..... 18
 Wings not thus clear; stigma darker; pubescence dull or yellowish white.... 22
18. Mesothorax blue, sparsely punctured; abdomen polished, impunctate (New
 Mexico)..... semicoerulesus Cockerell.
 Mesothorax golden or blue-green, more closely punctured; abdomen punc-
 tured..... 19
19. Head oval; disk of propodeum with discontinuous plicae..... pruinosus Robertson.
 Head normal, subcircular..... 20

20. Apex of flagellum ferruginous; mesothorax opaque, closely punctured; disk of propodeum with irregularly anastomosing rugae (New Mexico).
microlepoides Ellis.
 Flagellum not ferruginous; mesothorax polished, coarsely punctured..... 21
21. Disk of propodeum brilliant blue, rugose.....*pruiniformis* Crawford.
 Disk of propodeum color of mesothorax, rugulose (Colorado).
glaucoviridis Cockerell.
22. Mesothorax very closely punctured with both coarse and finer punctures; disk of propodeum plicate (California).....*diversopunctatus* Ellis.
 Mesothorax not thus punctured..... 23
23. Head narrow; orbits almost parallel; flagellum yellow-testaceous beneath (Colorado).....*pavoninus* Ellis.
 Head normal, subcircular; orbits converging..... 24
24. Tegulae dark; dark blue-green species..... 25
 Tegulae light; lighter species..... 26
25. Abdomen obovate; disk of propodeum shining, plicate (Colorado).
sedi, new species.
 Abdomen more slender; disk of propodeum brilliant blue, with irregularly anastomosing rugae (New Mexico).....*veganus* Cockerell.
26. Wings and tegulae reddish; mesothorax opaque, very closely punctured; disk of propodeum granular (Colorado).....*lazulis* Ellis.
 Wings and tegulae not reddened..... 27
27. Mesothorax polished olive green, delicately punctured; disk of propodeum long, plicae confined to basal part (Colorado).....*academicus*, new species.
 Mesothorax golden green, closely punctured..... 28
28. Head comparatively broad; disk of propodeum granular; pubescence yellowish; flagellum yellow-testaceous beneath (California).
actinosus, new species.
 Head normal..... 29
29. (These seem to be very closely related.)
 Flagellum dusky ferruginous at apex; disk of propodeum microscopically tessellate between anastomosing rugae (Illinois).....*pilosus* Smith.
 Species little smaller:
 Flagellum clear ferruginous at apex; scutellum golden green (Colorado)
succinipennis Ellis.
 Scutellum color of mesothorax; disk of propodeum longer than in the two preceding species, polished at the apex (Maine).
pilosus leucocomus Lovell.
30. Abdomen dusky red..... 31
 Abdomen clear red or orange-red..... 35
31. Larger, 6-7 mm. long..... 32
 Smaller, less than 5 mm. long..... 33
32. Wings faintly dusky; head and thorax olive green; very closely punctured (California).....*petrellus* Cockerell.
 Wings very clear; head and thorax shining blue-green, more sparsely punctured (New Mexico).....*eophilus* Ellis.
33. Head and thorax blue-green; flagellum ferruginous, paler beneath.
stultus Cresson.
 Head and thorax olive green; flagellum dark..... 34
34. Abdomen largely dark and submetallic; the light parts orange-ferruginous (Florida).....*nymphaelis* Smith.
 Abdomen chestnut red, a little greenish on middle of third segment (Nebraska).....*pictus* Crawford.

52. Head narrow; flagellum clear ferruginous; disk of propodeum polished.
semibrunneus Cockerell.
 Head normal; flagellum dark; disk of propodeum faintly granular with fine
 radiating plicae (Eastern States)..... *sparsus* Robertson.
 Disk of propodeum not granular; mesothorax more coarsely punctured
 (Western States)..... *sparsus*, variety Ellis MSS.
53. Mesothorax polished, delicately punctured; disk of propodeum weakly pli-
 cate on base only *exiguus* Smith.
 Mesothorax opaque; sculpturing of disk of propodeum, not confined to base... 54
54. Mesothorax with sparse shallow punctures; disk of propodeum plicate (Massa-
 chusetts)..... *admirandus*, new species.
 Mesothorax more closely punctured; disk of propodeum rugose (Nevada).
nevadensis Crawford.
55. Tegulae dark; wings dusky; stigma dark..... 56
 Tegulae light; or if somewhat dark, wings not dusky..... 63
56. Head and thorax brassy or bronze green; abdomen with bronze reflections;
 disk of propodeum plicate on base only (Guatemala)..... *umbripennis* Ellis.
 Head and thorax not so..... 57
57. Mesothorax polished, sparsely punctured; disk of propodeum with weak pli-
 cae largely confined to base (Colorado)..... *tenax*, new species.
 Mesothorax opaque, more closely punctured..... 58
58. Mesothorax very closely punctured, giving a granular appearance; disk of
 propodeum granular, apex polished (Colorado and New Mexico).
ruidosensis Cockerell.
 Mesothorax not so closely punctured; disk of propodeum not granular. 59
59. Larger; mesothorax very coarsely punctured; disk of propodeum very sharply
 truncated, with coarse plicae (New Jersey)..... *oceanicus* Cockerell.
 Smaller; not so sculptured..... 60
60. Abdomen and legs brown; mandibles red; disk of propodeum with radiating
 rugulae (Grenada, W. I.)..... *sanctivincenti* Ashmead.
 Abdomen and legs black; mandibles dark..... 61
61. Flagellum dusky ferruginous; disk of propodeum short, the plicae not reach-
 ing the apex, which is polished (Maine)..... *versans* Lovell.
 Flagellum black; plicae reaching the apex of disk of propodeum, which is
 longer (Colorado)..... 62
62. Mesothorax with shallow, scattered punctures; apical margins of abdominal
 segments testaceous; abdomen narrower at base..... *pacatus*, new species.
 Mesothorax quite closely punctured; apical margins of abdominal segments
 black; abdomen broad at the base..... *viridatulus* Cockerell.
63. Wings clear white; pubescence pure white, abundant..... 64
 Wings more or less yellowish; pubescence more sparse, dull or yellowish white.. 67
64. Mesothorax very coarsely punctured; disk of propodeum with somewhat dis-
 continuous plicae; abdomen black..... *albipennis* Robertson.
 Mesothorax not so coarsely punctured; abdomen brown..... 65
65. Smaller; mesothorax blue, delicately punctured; disk of propodeum reticu-
 lated (New Mexico)..... *alius*, new species.
 Larger; mesothorax golden green, closely punctured; disk of propodeum not
 reticulated..... 66
66. Disk of propodeum brilliant blue, granular (New Mexico)..... *perdifficilis* Cockerell.
 Disk of propodeum color of mesothorax, plicate, polished at the apex (Leth-
 bridge Alta.)..... *laevissimus* Smith.
67. Face subquadrate; inner orbits arched above; clypeus and supraclypeal area
 polished 68
 Not so; head narrow or subcircular..... 69

68. Mesothorax delicately punctured (Eastern States)..... *hortensis* Lovell.
 Mesothorax coarsely punctured (Western States)..... *crassiceps* Ellis.
69. Head and thorax rugoso-punctate (See 6) (Iowa and Nebraska)..... *bruneri* Crawford.
 Head and thorax with more or less distinct punctures..... 70
70. Head very narrow; flagellum clear ferruginous; mesothorax granular, with
 shallow punctures; disk of propodeum granular (North Carolina).
longiceps Robertson.
 Not so..... 71
71. Small and slender species; abdomen somewhat bluish; disk of propodeum
 obscurely sculptured (Colorado)..... *tennis* Ellis.
 Not so..... 72
72. Mesothorax golden or brassy green..... 73
 Mesothorax not so colored..... 80
73. Mesothorax coarsely punctured..... 74
 Mesothorax with fine or delicate punctures..... 77
74. Mesothorax with contiguous punctures; disk of propodeum with irregularly
 anastomosing rugae (Colorado)..... *perpunctatus* Ellis.
 (Mesothorax not or hardly golden, but with similar punctation to that above;
 disk of propodeum with rugae not anastomosing (California) (Ellis MSS).
perpunctatus, var. *californiae* Ellis, new variety.²
 Not so punctured..... 75
75. Tegulae pale; wings clear; disk of propodeum microscopically tessellate
 between rugae; apex of abdomen somewhat greenish (Texas).
disparilis Crawford.
 Tegulae and wings reddened, abdomen entirely black (New Jersey)..... 76
76. Mesothorax polished; disk of propodeum strongly rugose..... *cressonii* Robertson.
 Mesothorax opaque; disk of propodeum plicate..... *cattellae* Ellis.
77. Small; mesothorax very closely punctured, bronzen; disk of propodeum
 granular with radiating plicae (Jamaica)..... *gemmatus* Smith.
 Larger; not so..... 78
78. Disk of propodeum obscurely sculptured; legs and abdomen brown, with
 yellowish pubescence (Illinois)..... *zephyrus* Smith.
 Legs and abdomen black; disk of propodeum not so sculptured..... 79
79. Legs entirely black; tegulae reddened; disk of propodeum plicatulate (New
 Mexico)..... *caducus*, new species.
 Legs not so, with knees red; tegulae pale; disk of propodeum with anasto-
 mosing rugae (California)..... *impavidus*, new species.
80. Mesothorax opaque, closely or coarsely punctured..... 81
 Mesothorax shining, delicately or sparsely punctured..... 85
81. Tegulae reddish; mesothorax with coarse punctures; disk of propodeum
 plicate (Maine)..... *viridatus* Lovell.
 (Mesothorax somewhat brassy, more slender; plicae somewhat wrinkled.
viridatus, variety *a*, new variety).³
- Tegulae pale; mesothorax finely punctured..... 82
82. Disk of propodeum granular (Florida)..... 83
 Disk of propodeum not granular..... 84

² Mrs. Ellis had the following notes on this variety: "California specimens of *perpunctatus* differ in the mesothorax being smoother, the punctures being smaller; basal area of the metathorax with the rim a little sharper in the variety. Two specimens, Pasadena."

³ Mrs. Ellis had pointed out this variety, but a name now preoccupied was given. The writer has preferred to designate the variety by a letter only. Mrs. Ellis's notes were as follows: "Variety *a* is more slender and has the abdomen more metallic and the margins of the abdominal segments less testaceous."

83. Larger; pubescence yellowish; legs brown; abdomen brownish, apical margins of segments broadly testaceous.....*floridanus* Robertson.
Smaller; pubescence dull white; legs and abdomen black.....*ashmeadii* Robertson.
84. Disk of propodeum shining, microscopically tessellate between discontinuous plicae.....*versatus* Robertson.
Disk of propodeum dull, with irregular, wrinkled rugae (New Mexico).
comis, new species.
85. Tegulae somewhat reddened (Mountain States)..... 86
Tegulae pale testaceous..... 89
86. Smaller, slender species; plicae confined to base of disk of propodeum..... 87
Larger, robust species; head broad; plicae reaching the apex of the disk of propodeum..... 88
87. Disk of propodeum blue, shining, with few plicae.....*meritus*, new species.
Disk of propodeum green; plicate at sides of disk; somewhat anastomosing rugae on median part of disk.....*arcanus*, new species.
88. Disk of propodeum crescentic.....*latus*, new species.
Disk of propodeum longer; plicae weak on median part of disk.
phacelliarum Cockerell.
89. Mesothorax and scutellum polished, dark, very sparsely punctured; disk of propodeum plicate on base only; flagellum ferruginous; mandibles clear red (Guatemala).....*tropicolor* Ellis.
Not so; mesothorax blue-green, or lighter green..... 90
90. Head broad; robust species; disk of propodeum plicate (Iowa).
unicus, new species.
- Head normal or narrow; more slender species..... 91
91. Abdomen brownish, slender, with quite abundant white hair; disk of propodeum finely granular with few weak plicae (New Mexico).....*oblongus* Lovell.
Abdomen black, broader, first two segments without pubescence..... 92
92. Legs entirely black; disk of propodeum microscopically tessellate between rugae..... 93
Knees and tarsi reddened..... 94
93. Abdomen sparsely pubescent (Maine).....*oblongus planatus* Lovell.
Abdomen with subappressed hair (Nebraska).....*politissimus* Cockerell.
94. Disk of propodeum plicate (Colorado).....*absimilis*, new species.
Disk of propodeum weakly rugulose on base only (Iowa).
vintonensis, new species.

KEY TO MALES OF *HALICTUS* (*CHLORHALICTUS*).⁴

- Legs entirely red; under side of abdomen red.....*aquilae* Cockerell.
Legs not entirely red; under side of abdomen not red; or if reddish, then upper side also reddish..... 1
1. Thorax and abdomen testaceous.....*bruesi* Cockerell.
Thorax not testaceous..... 2
2. Small species with punctured tegulae..... 3
Tegulae not punctured..... 6
3. Mesothorax steel blue; flagellum pale beneath..... 4
Mesothorax dark blue or greenish blue; flagellum little paler beneath..... 5
4. Disk of propodeum brilliant blue, crescentic, plicate; flagellum yellow-testaceous beneath (California).....*gaudialis*, new species.
Disk of propodeum color of mesothorax, longer, rugose; flagellum chrome-orange beneath (New Mexico).....*regulariformis* Crawford.

⁴ See second paragraph of introduction for statement of species included in this key.

5. Wings faintly reddish; face color of mesothorax (Colorado).
paulinus, new species.
 Wings clear; stigma and nervures testaceous; face olive green (Guatemala).
pseudotegularis Cockerell.
6. Abdomen blue or green..... 7
 Abdomen not blue or green..... 11
7. Larger; golden green; pubescence ochraceous; wings yellowish (Massachusetts).
pilosus Smith.
 Smaller; blue; pubescence pure white; wings very clear..... 8
8. Head broader than long; disk of propodeum with a semicircular inclosing rim.
 (New Mexico)..... *exalbidus*, new species.
 Head not so; disk of propodeum not so inclosed 9
9. Hoary with very dense white pubescence; disk of propodeum brilliant blue,
 plicate *pruinosisformis* Crawford.
 Not so 10
10. Disk of propodeum with irregularly wrinkled rugae; first recurrent nervure
 joining second transverso-cubital (New Mexico) *albohirtus* Crawford
 Disk of propodeum polished, obscurely sculptured; second submarginal cell
 receiving first recurrent nervure a little distance from the apex (Colorado).
actarius, new species.
11. Abdomen red, suffused with blackish; head and thorax green; disk of pro-
 podeum plicate (Illinois) *zephyrus* Smith.
 Abdomen black or dark brown 12
12. Clypeus entirely yellow, or at least the lower half yellow..... 13
 Clypeus not yellow, or the anterior margin obscurely yellowish..... 18
13. Head and thorax olive green; flagellum dark (Colorado) *sagax*, new species.
 Head and thorax blue-green or blue; flagellum pale beneath 14
14. Tegulae very pale; legs largely yellow..... 15
 Tegulae dark; legs largely dark..... 16
15. Mesothorax somewhat brassy; abdomen punctured (New Mexico).
hyalinus Crawford.
 Mesothorax blue-green; abdomen not punctured (New Mexico).
perexiguus, new species.
16. Mesothorax delicately punctured; mandibles yellow (Colorado).
occultus, new species.
 Mesothorax closely punctured; mandibles dark (Colorado) 17
17. Head and thorax blue-green; disk of propodeum subcrescentic.
vestigatus, new species.
 Head and thorax blue; disk of propodeum longer, brilliant blue.
pikel, new species.
18. Tegulae and stigma dark; wings dusky; usually larger species, except
insulus and *obnubilus* 19
 Tegulae and wings pale; or if tegulae reddened, then wings paler; usually
 small species, except *nymphaearum*, *connexus*, and *albipennis* 29
19. Small species, less than 5 mm. long 20
 Larger species 21
20. Mesothorax blue-green; disk of propodeum plicate (Colorado).
obnubilus, new species.
 Mesothorax blue; disk of propodeum plicate on base only (New Mexico).
insulsus, new species.
21. Head and thorax brassy olive green; disk of propodeum rugose.
oblongus Lovell.
- Head and thorax blue or green, not brassy..... 22
22. Sculpturing confined to disk of propodeum 23
 Sculpturing not confined to disk of propodeum..... 24

23. Disk of propodeum plicatulate; apex polished; mesothorax closely punctured (Colorado).....*ruidosensis* Cockerell.
Disk of propodeum with somewhat wrinkled plicae reaching the apex; mesothorax more sparsely punctured (Colorado).....*consonus*, new species.
24. Mesothorax shining, sparsely or delicately punctured..... 25
Mesothorax opaque, coarsely punctured..... 26
25. Front above the antennae very closely punctured; disk of propodeum rugose (Colorado).....*praepes*, new species.
Front above the antennae without true punctures; apex of disk of propodeum elevated, tessellate, base weakly plicate (New Mexico).
astutus, new species.
26. Tegulae and wings reddened; flagellum ferruginous beneath; mesothorax dark blue; pubescence on mesothorax and vertex yellowish (New Mexico).
abundus, new species.
- Tegulae and wings not reddened; flagellum testaceous beneath..... 27
27. Disk of scutellum dull; disk of propodeum dull with irregular rugae (New Mexico).....*tranquillus*, new species.
Disk of propodeum shining; disk of scutellum with two polished spots.... 28
28. Mesothorax blue; disk of propodeum plicate (Colorado)....*pudicus*, new species.
Mesothorax green; disk of propodeum coarsely rugose.....*viridatus* Lovell.
29. Large, 7 mm. long; disk of propodeum rugose..... 30
Smaller..... 32
30. Tegulae pale testaceous; mesothorax closely punctured (Texas).
connexus Crawford.
Tegulae reddened; mesothorax very coarsely punctured..... 31
31. Wings milky white; stigma honey color; flagellum yellow-testaceous beneath.
albipennis Robertson.
Wings not so; flagellum testaceous beneath.....*nymphaearum* Robertson.
32. Wings milky white; stigma and nervures honey color; mesothorax very coarsely punctured; disk of propodeum plicate (Colorado).
lactineus, new species.
Not so 33
33. Mesothorax opaque, microscopically tessellate, very closely punctured.... 34
Mesothorax shining, sparsely or delicately punctured..... 37
34. Head and thorax golden green; disk of propodeum plicate (Virginia).
callidus, new species.
Head and thorax blue or blue-green, not golden..... 35
35. Flagellum clear ferruginous; mandibles yellow; propodeum with discontinuous plicae (Virginia).....*apertus*, new species.
Flagellum testaceous, yellow-testaceous beneath; mandibles dark..... 36
36. Tegulae reddish; disk of propodeum plicate; pubescence of abdomen yellowish (Virginia).....*genuinus*, new species.
Tegulae pale testaceous; disk of propodeum rugose; pubescence of abdomen not yellowish.....*versatus*, Robertson.
37. Mesothorax coarsely punctured..... 38
Mesothorax delicately punctured 40
38. Head and thorax brassy green; tip of clypeus and mandibles yellowish (Texas) *disparilis* Crawford.
Head and thorax blue 39
39. Disk of propodeum strongly rugose, the rugae not confined to the disk (Connecticut) *basilicus*, new species.
Disk of propodeum brilliant blue, plicae confined to the disk.
nevadensis Crawford.

40. Very small, anterior wing about 3 mm. long 41
 Larger 43
41. Head and thorax brassy green; flagellum black; disk of propodeum with plicae on base only, apex polished (Vera Cruz, Mexico) *exiguus* Smith.
 Head and thorax blue; flagellum testaceous beneath 42
42. Disk of propodeum deep blue, short, plicate; knees and tarsi yellow (Virginia) *hortensis* Lovell.
 Disk of propodeum brilliant blue, longer, with fine, somewhat wrinkled plicae; legs entirely dark (New Mexico) *microlepoides* Ellis.
43. Tegulae somewhat reddened; legs black; mandibles dark 44
 Tegulae very pale; knees and tarsi red; mandibles red 45
44. Flagellum testaceous beneath; face, mesothorax, scutellum and mesopleurae brassy (Colorado) *mactus*, new species.
 Flagellum hardly paler beneath; not thus brassy (Colorado).
pensitus, new species.
45. (The following are very similar in size, color, punctuation, etc.):
 Third joint of antennae somewhat longer than second 46
 Third joint of antennae hardly or no longer than second 47
46. Disk of propodeum plicate (Colorado) *accentus*, new species.
 Disk of propodeum rugose (New Mexico) *incompletus* Crawford.
47. Abdomen entirely black, punctured (Colorado) *molliis*, new species.
 Abdomen with piliferous punctures only, apical margins of segments testaceous 48
48. Mesothorax sparsely and delicately punctured; disk of propodeum plicate (New Mexico) *merosus*, new species.
 Mesothorax more closely punctured; disk of propodeum rugose 49
49. Disk of propodeum crescentic, with irregularly anastomosing rugae reaching the apex; legs and abdomen brown (Virginia) *malinus*, new species.
 Disk of propodeum long, rugae reaching the apex which is polished; abdomen and legs black (Iowa) *insolitus*, new species.

DESCRIPTIONS OF NEW SPECIES.

HALICTUS (CHLORALICTUS) OLIVARIUS, new species.

Female.—About 8.5 mm. long; dark olive green; pubescence pale; facial quadrangle longer than broad; front closely punctured, the punctures becoming more scattered on the sides of the face; antennae brown, becoming bright ferruginous at the apex of the flagellum; orbits converging slightly below; clypeus black, coarsely punctured; supraclypeal area brassy, sparsely punctured. Mesothorax golden green, very closely punctured; parapsidal grooves quite indistinct; scutellum closely punctured; disk of propodeum appears rugose, but is covered with finely wrinkled anastomosing rugae making an irregular reticulate surface; truncation well defined laterally; tegulae pale testaceous, impunctate. Abdomen ovate, without distinct hair bands, but with pale pubescence covering the segments; apical margins of segments testaceous. Wings yellowish, faintly dusky; anterior wing about 6 mm. long; stigma and nervures pale testaceous; basal nervure very strongly bent; third submarginal cell strongly contracted above; more than twice as long as second on marginal; second submarginal higher than broad, receiving first recurrent nervure very

near apex. Legs dark with dull whitish hairs; knees red; tarsi somewhat reddened; hind spur pectinate with five medium long obtuse spines.

Habitat.—Jumbo Reservoir, 9 miles east of Crook, Colorado, August 12, 1921 (Sandhouse). One specimen.

Type.—Cat. No. 26399, U.S.N.M.

This species seems to be quite distinct and different from any other *Chloralictus* known to the writer.

HALICTUS (CHLORALICTUS) ELLISIAE, new species.¹

Female.—About 5 mm. long; head and thorax dark olive green, abdomen black; pubescence dull white, rather sparse. Facial quad-angle longer than broad; orbits converging slightly below; antennae dark brown; front very closely punctured; sides of face with coarser, deeper, more scattered punctures; supraclypeal area shining, sparsely punctured; lower two-thirds of clypeus black, with a few coarse punctures; mandibles black. Mesothorax microscopically lineolate and closely punctured; scutellum very closely punctured, two smooth spots on the disk; disk of propodeum without a distinct inclosing rim, microscopically reticulate between rugae; mesopleurae coarsely punctured; tegulae dark, punctured; truncation distinct, but not sharply defined laterally. Abdomen broadly ovate, the only punctures piliferous; segments sparsely clothed with yellowish-white pubescence; apical margins of segments brownish, transversely lineolate. Anterior wing 3.5 mm. long; wings clear hyaline; stigma and nervures dark testaceous; second submarginal cell as broad as high at the base, but contracted above, receiving the first recurrent nervure near apex; third submarginal almost twice as long as second on marginal. Legs dark with yellowish-white pubescence; inner spur pectinate with four moderately long teeth.

Habitat.—Forest Hills, Massachusetts, August 5, 1911. Received from Dr. W. M. Wheeler. One specimen.

Type.—Cat. No. 26400, U.S.N.M.

Distinct from *regulariformis* Crawford, from which it differs by the darker tegulae and stigma; broader head; darker flagellum; more closely punctured mesothorax; more robust species; distinct sculpturing of disk of propodeum.

From *regularis* Robertson by the shining head and thorax; darker wings; tegulae darker, not reddish; darker flagellum; disk of propodeum not granular, but with fine plicae.

From *pseudotegularis* Cockerell, which is a very small and slender species, with golden green mesothorax and scutellum, and with disk of propodeum granular.

¹ Mrs. Ellis referred this specimen to *hortensis* Lovell, but the punctured tegulae seem to be distinct. The species was named for Mrs. Ellis.

From *perparvus* Ellis, which is very small and dark, with delicately punctured tegulae; and has a golden green mesothorax and the disk of the propodeum granular.

HALICTUS (CHLORALICTUS) SEDI, new species.

Female.—About 6 mm. long; dark greenish blue; pubescence dull white, rather sparse. Facial quadrangle longer than broad; sides of face, supraclypeal area, and upper portion of clypeus brassy green; front very closely punctured, the punctures becoming more scattered below; supraclypeal area and upper portion of clypeus with few deep punctures; lower part of clypeus black, without punctures; flagellum black, dark testaceous beneath. Mesothorax microscopically tessellate, with delicate punctures; scutellum closely punctured, two polished spots on the disk; disk of propodeum shining, with fine plicae on the lateral, and anastomosing rugae on the median portions, polished at the apex; mesopleurae indistinctly punctured; tegulae testaceous, impunctate; truncation well defined laterally. Abdomen obovate, polished, very delicately punctured, without distinct hair bands, but segments sparsely covered with hairs; apical margins of segments testaceous. Anterior wing about 4.5 mm. long; wings quite clear; stigma and nervures pale testaceous; second submarginal cell as broad as high, receiving the first recurrent nervure near the apex; almost equidistant with the third submarginal on marginal; subcostal nervure very dark. Legs dark with dull white pubescence; hind spur pectinate with four moderately long teeth.

Habitat.—Boulder, Colorado: 1 specimen June 21, on *Sedum stenopetalum* (Cockerell); 1 specimen May 20 (M. Pope).

Type.—Cat. No. 26401, U.S.N.M.

Distinguished by the highly polished abdomen.

HALICTUS (CHLORALICTUS) ACADEMICUS, new species.

Female.—About 6 mm. long; dark blue-green; pubescence yellowish white. Facial quadrangle longer than broad; orbits converging slightly below; the only punctures on the face piliferous; antennae dark, flagellum ferruginous beneath; clypeus and supraclypeal area smooth and highly polished, without punctures, flat; lower half of clypeus black. Mesothorax shining, the only punctures piliferous; disk of propodeum rather long, microscopically tessellate, weakly plicate on the base only; truncation distinct laterally; tegulae very pale testaceous, impunctate. Abdomen obovate, without distinct hair bands, but the segments clothed with rather sparse pubescence; apical margins of segments testaceous. Wings faintly yellowish; anterior wing 4.2 mm. long; stigma and nervures pale testaceous; third submarginal cell subquadrate, a little longer than the second

on the marginal; second submarginal higher than broad, receiving the first recurrent nervure quite near the apex. Legs dark, quite densely pubescent; knees and tarsi red.

Habitat.—Boulder, Colorado, May 14 (Irene Bleasdale).

Type.—Cat. No. 26402, U.S.N.M.

Differs from *lazulis* Ellis by the darker color; more weakly punctured mesothorax; smooth clypeus and supraclypeal area; sculpturing of disk of propodeum distinct.

Distinguished by the very delicately punctured mesothorax, and the clypeus and supraclypeal area very flat and polished.

HALICTUS (CHLORALICTUS) ACTINOSUS, new species.

Female.—About 5.5–6 mm. long; golden or brassy green; pubescence yellowish white. Facial quadrangle about as long as broad; front and vertex very closely punctured, the punctures becoming more scattered on the sides of the face; supraclypeal area and upper half of clypeus shining golden green with a few coarse punctures; lower half of clypeus black; inner orbits converging below; antennae dark, the flagellum rufo-testaceous beneath. Mesothorax microscopically lineolate, very closely punctured; scutellum with deep punctures, two small polished spots on the disk; disk of propodeum coarsely granular with rather faint irregular rugae making a reticulate surface, without an inclosing rim, but polished apically; mesopleura irregularly punctured; truncation well defined laterally; tegulae very pale testaceous, impunctate. Abdomen obovate, impunctate; the segments clothed with dense pubescence; apical margins of segments pale testaceous. Wings faintly yellowish; anterior wing 4.5 mm. long; stigma and nervures pale testaceous; second submarginal cell almost as broad as long, and almost as long as the third on the marginal; third submarginal gently contracted above, first recurrent nervure joining the second transverso-cubital; subcosta very dark. Legs dark with yellowish pubescence.

Habitat.—California, labeled No. 846; collector and exact locality unknown.

Type.—Cat. No. 26403, U.S.N.M.

Differs: From *vegans* Cockerell in having a broader head; paler tegulae and wings; head and thorax green; sculpturing of disk of propodeum distinct.

From *floridanus* Robertson by the broader head; clypeus and supraclypeal area distinctly brassy; paler hairs; head and thorax golden green; disk of propodeum not granular.

From *succinipennis* Ellis by the broader head; more closely punctured head and thorax; shorter disk of propodeum with distinct sculpturing.

HALICTUS (CHLORALICTUS) LIGUANENSIS, new species.

Female.—About 5 mm. long; head and thorax olive green; abdomen black; pubescence rather short and dull white. Facial quadrangle longer than broad; orbits converging slightly below; antennae entirely dark, the flagellum hardly paler beneath; face very delicately punctured, the punctures more scattered below and on the sides of the face; lower half of clypeus shining black with a few punctures; upper half of clypeus and supraclypeal area lineolate and sparsely punctured; mandibles reddish. Mesothorax microscopically lineolate, delicately punctured, the punctures more scattered on the disk; median and parapsidal grooves distinct, but not deeply impressed; sculpturing of scutellum similar to that of the mesothorax, two polished spots on the disk; disk of propodeum without an inclosing rim, faintly tessellate with a few plicae at the base of the area; truncation distinct laterally; tegulae reddish, impunctate. Abdomen obovate, shining, impunctate; segments clothed with rather scant pubescence. Wings faintly dusky; anterior wing about 3.5 mm. long; stigma and nervures dark testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure near the apex; third submarginal a little longer than second on marginal. Legs dark with yellowish hairs; knees and tarsi somewhat reddened.

Habitat.—Liguanea Plains, Jamaica, November-December 1911 (C. T. Brues).

Type.—Cat. No. 26404, U.S.N.M.

Mrs. Ellis referred this specimen with doubt to *jamaicae*, but it seems to be distinct.

Differs: From *jamaicae* Ellis by the darker tegulae; disk of propodeum not lineolate, and plicate at base only; scutellum with two polished spots on disk; face more sparsely punctured.

From *deceptor* Ellis by the broader face; vertex with closer punctures; legs not entirely dark; mesothorax more sparsely punctured.

HALICTUS (CHLORALICTUS) ADMIRANDUS, new species.

Female.—About 5-5.5 mm. long; head and thorax blue-green; abdomen black; pubescence white, rather dense. Facial quadrangle longer than broad; orbits converging below; antennae brown-ferruginous, becoming ferruginous at the apex of the flagellum; face covered with moderately close hairs; front closely punctured, the punctures more sparse on the sides of the face; supraclypeal area and upper part of the clypeus blue-green, microscopically lineolate and delicately punctured; lower half of clypeus shining black, with few coarse punctures; mandibles faintly reddish. Thorax quite densely pubescent; mesothorax dull, microscopically tessellate, with quite close but shallow punctures; punctation of scutellum similar to that of the mesothorax, two punctureless spots on the disk; disk

of propodeum without a distinct inclosing rim, shining, plicae extending across the disk and reaching the apex; truncation clearly defined laterally; tegulae very pale, impunctate. Abdomen obovate, shining; segments 1-2 rather sparsely pubescent; segments 3-5 clothed with dense, appressed hairs; apical margins of segments testaceous. Wings clear; anterior wing about 3.5 mm. long; stigma and nervures honey color, except the costal nervure which is dark testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure very near the apex; third submarginal little longer than second on marginal. Legs dark, covered with white hairs; knees and tarsi clear red; hind spur not visible.

Habitat.—Woods Hole, Massachusetts (Eleth Cattell).

Type.—Cat. No. 26405, U.S.N.M.

HALICTUS (CHLORALICTUS) TENAX, new species.

Female.—About 5.5-6 mm. long; head and thorax dark blue-green; abdomen black; pubescence yellowish white, sparse. Facial quad-angle longer than broad; orbits converging slightly below; antennae entirely dark; face shining dark blue; vertex closely punctured; front with a brassy tint, sparsely punctured; supraclypeal area and upper half of clypeus somewhat brassy, rather closely punctured; clypeus shining black below, with few coarse downward-opening punctures; apex of mandibles red. Mesothorax shining, microscopically lineolate; quite closely punctured, the punctures a little more scattered on the disk; scutellum closely punctured, two smooth spots on the disk, each of these spots has two very large punctures; disk of propodeum without an inclosing rim, smooth, shining, dark blue, with a few plicae at the base of the disk only; truncation well defined laterally; tegulae dark testaceous, impunctate. Abdomen obovate, piceous, impunctate; segments 1-2 almost without hairs; segments 3-5 with sparse white hairs; apical margins of segments narrowly testaceous. Wings faintly dusky; anterior wing 4 mm. long; stigma and nervures testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure near the apex; third submarginal about one and one-half times as long as second on marginal. Legs dark with yellowish white pubescence; hind spur pectinate with three moderately long teeth; tips of hind basitarsi and apical tarsi reddened.

Habitat.—Longs Peak Inn, Colorado, June 25, and August 13 (Cockerell). Three specimens.

Type.—Cat. No. 26406, U.S.N.M.

Differs from *viridatulus* Cockerell by the shining mesothorax with weak punctures, not lineolate; head, mesothorax, and propodeum more brilliant blue; disk of propodeum without such strong plicae.

HALICTUS (CHLORALICTUS) PACATUS, *new species*.

Female.—About 6 mm. long; head and thorax dark green; abdomen black; pubescence white. Facial quadrangle longer than broad; orbits converging below; antennae dark, the flagellum scarcely paler beneath; front closely punctured; sides of face with shallow open punctures; supraclypeal area and upper portion of clypeus microscopically lineolate and coarsely punctured; lower half of clypeus shining black, with few coarse punctures. Mesothorax broad, microscopically tessellate, with moderately close, but coarse punctures evenly distributed over the surface; scutellum finely punctured, two polished spots on the disk; disk of propodeum without a distinct inclosing rim, microscopically tessellate, with few slightly wrinkled plicae reaching the apex; truncation well defined laterally; tegulae dark testaceous, impunctate. Abdomen obovate, impunctate; the first segment almost without hairs, the other segments sparsely clothed with short hairs. Wings somewhat dusky; anterior wing about 4.5 mm. long; stigma and nervures testaceous; second submarginal cell slightly higher than broad receiving the first recurrent nervure near the apex; third submarginal little longer than second on marginal. Legs dark with yellowish white hairs; hind spur pectinate with four moderately long teeth.

Habitat.—Peaceful Valley, Colorado, 1919 (Cockerell). Two specimens.

Type.—Cat. No. 26407, U.S.N.M.

HALICTUS (CHLORALICTUS) ALIUS, *new species*.

Female.—About 5-5.5 mm. long; head and thorax blue-green; abdomen black; pubescence white. Facial quadrangle somewhat longer than broad; flagellum rufo-testaceous, paler beneath; front with rather close shallow punctures, the punctures deeper and more scattered on the sides of the face; supraclypeal area and upper half of clypeus delicately punctured; lower half of clypeus shining black, coarsely punctured; fringed with yellowish hairs; mandibles red. Thorax clothed with rather abundant pubescence; mesothorax shining, with faint microscopic lineolations and rather close, shallow punctures; punctation of scutellum similar to that of the mesothorax, two polished spots on the disk; disk of propodeum long, inclosed by a low rim, shining, microscopically tessellate, with faint, very irregularly anastomosing rugae; truncation distinct laterally; tegulae very pale testaceous, impunctate. Abdomen ovate, impunctate; segments 1-2 shining, sparsely pubescent; segments 3-5 clothed with dense subappressed hairs. Wings very clear; anterior wing 4.25 mm. long; stigma and nervures very pale testaceous; second submarginal cell considerably higher than broad, receiving first

recurrent nervure near the apex; third submarginal subquadrate, little longer than the second on marginal. Legs dark with dull white hairs; knees, tips of tibiae, and tarsi pale rufo-testaceous; hind spur pectinate with four moderately long teeth.

Habitat.—La Cueva, Organ Mountains, New Mexico, September 2, at flowers of *Nuttallia multiflora* (Townsend).

Type.—Cat. No. 26408, U.S.N.M.

HALICTUS (CHLORALICTUS) CADUCUS, new species,

Female.—About 6.5 mm. long; head and thorax dark olive green; abdomen black; pubescence dull white. Facial quadrangle longer than broad; orbits converging slightly below; face with a bronze reflection, clothed with rather sparse pubescence; antennae dark, the flagellum becoming dark ferruginous at the apex; vertex very closely punctured; front with more scattered deep punctures; part of clypeus and supraclypeal area bronze green, sparsely punctured; lower half of clypeus shining black, with a few downward-opening punctures, fringed below with yellowish hairs; mandibles dark, reddish at the tips. Mesothorax brassy green, shining, with faint microscopic tessellations and scattered punctures; scutellum brassy green, delicately punctured on the anterior part, the punctures coarser posteriorly, two polished spots on the disk; disk of propodeum without a distinct inclosing rim, slightly elevated posteriorly, median portion of disk finely granular with a few anastomosing rugae, the lateral portions plicatulate, the plicae extending on to the sides of the propodeum; truncation distinct laterally; tegulae reddish testaceous, impunctate. Abdomen piceous, obovate; apical margins of segments testaceous; segments 1-2 shining, sparsely pubescent; segments 3-5, with appressed, dull white hairs. Wings clear yellowish; anterior wing 4.5 mm. long; stigma and nervures very pale testaceous; second submarginal cell almost as broad as long; first recurrent nervure joining second transverso-cubital; third submarginal sharply contracted above, about equidistant with the second on the marginal. Legs dark with dull white pubescence; hind spur pectinate with three teeth.

Habitat.—Santa Fe, New Mexico, October 3, at garden marigold No. 5620 (Cockerell).

Type.—Cat. No. 26409, U.S.N.M.

Differs: From *versatus* Robertson by the reddened tegulae; mesothorax shining, with more scattered punctures; more slender species; face shining; more sparse pubescence; polished scutellum.

From *nevadensis* Crawford by the larger size; more golden green face and mesothorax; more sparsely punctured mesothorax; disk of propodeum plicatulate.

HALICTUS (CHLORALICTUS) IMPAVIDUS, new species.

Female.—About 5.5–6 mm. long; head and thorax olive green; abdomen black; pubescence white. Facial quadrangle longer than broad; orbits converging below; face covered with rather abundant white hairs; front with close but shallow punctures, the punctures more scattered on the sides of the face; supraclypeal area and upper half of clypeus with a few deep punctures; lower half of clypeus black, with very few coarse punctures, fringed with yellowish hairs; antennae dark brown, the flagellum dark ferruginous beneath. Mesothorax brassy green, shining, quite closely punctured; scutellum shining, the disk entirely covered with delicate punctures; disk of propodeum without an inclosing rim, the median portion with irregularly anastomosing rugae; the sides of the disk plicate; mesopleurae with coarse shallow punctures; truncation well defined laterally; tegulae very pale testaceous, impunctate. Abdomen obovate, impunctate; apical margins of segments testaceous; segments 1-2 sparsely pubescent; segments 3-5, with more abundant white hairs. Wings clear; anterior wing 4.25 mm. long; stigma and nervures pale testaceous; second submarginal cell broader at the base than it is high, but contracted above, receiving the first recurrent nervure very near the apex; third submarginal gently contracted above, about one and one-half times as long as second on the marginal. Legs dark with yellowish-white pubescence; knees and tarsi reddened; hind spur pectinate with three moderately long teeth.

Habitat.—California; labeled No. 903. Collector and exact locality unknown.

Type.—Cat. No. 26410, U.S.N.M.

HALICTUS (CHLORALICTUS) COMIS, new species.

Female.—About 5–5.5 mm. long; head and thorax blue-green; abdomen black; pubescence white. Facial quadrangle somewhat longer than broad; orbits converging slightly below; antennae dark reddish brown, becoming scarcely paler at the apex of the flagellum; face clothed with moderately dense short white hairs; front very closely punctured; supraclypeal area and upper one-third of clypeus microscopically tessellate and sparsely punctured; clypeus largely black, shining, with a few coarse punctures, fringed with yellowish hairs; mandibles dark red. Thorax closely covered with rather short white hairs; mesothorax opaque, microscopically tessellate with rather close, deep punctures; punctation of scutellum similar to that of the mesothorax; disk of propodeum crescentic, without an inclosing rim, microscopically tessellate between irregular rugae; truncation well defined laterally; tegulae pale testaceous, impunctate. Abdomen obovate, impunctate, sparsely pubescent; apical margins of segments

brownish testaceous. Wings clear yellowish; anterior wing about 4 mm. long; stigma and nervures very pale testaceous; second submarginal cell higher than broad, gently contracted above; receiving first recurrent nervure very near the apex; third submarginal quite sharply contracted above, little longer than second on marginal. Legs dark brown, with dull white hairs; hind spur pectinate with three moderately long teeth; apical tarsi somewhat reddened.

Habitat.—Las Cruces (College Farm), New Mexico, on *Melilotus*, No. 2914 (Cockerell).

Type.—Cat. No. 26411, U.S.N.M.

HALICTUS (CHLORALICTUS) MERITUS, new species.

Female.—About 5.5 mm. long; head and thorax dark green; abdomen black; pubescence white, rather sparse. Facial quadrangle somewhat longer than broad; orbits converging slightly below; antennae dark, the flagellum hardly paler beneath; face with quite close, shallow punctures; above, the punctures become more dense; supraclypeal area and upper half of clypeus microscopically lineolate, sparsely punctured; lower half of clypeus black, very coarsely punctured, fringed with yellowish hairs. Mesothorax shining, microscopically lineolate, punctured, the punctures about twice the diameter of a puncture apart; scutellum similarly punctured, with two pointed spots on the disk; disk of propodeum shining dark blue, crescentic, without an inclosing rim, with coarse plicae not reaching the apex which is polished; truncation not sharply defined, but distinct laterally; tegulae red-testaceous, impunctate. Abdomen obovate, shining, impunctate; bases of segments with narrow bands of white appressed hair; apical margins of segments dark testaceous. Wings hyaline, faintly iridescent; anterior wing 4.25 mm. long; stigma and nervures rather pale testaceous; second submarginal higher than broad, receiving the first recurrent nervure quite near the apex; third submarginal very broad at the base, contracted above, about one and one-third times as long as second on the marginal. Legs black with yellowish hairs.

Habitat.—Halfway House, Pikes Peak, Colorado, May 30, at flowers. *Fragaria* (Cockerell).

Type.—Cat. No. 26412, U.S.N.M.

HALICTUS (CHLORALICTUS) ARCANUS, new species.

Female.—About 6 mm. long; head and thorax blue-green; abdomen black; pubescence white. Facial quadrangle longer than broad; orbits converging quite sharply below; face covered with rather sparse pubescence; antennae very dark brown, almost black, hardly paler beneath; front closely punctured; sides of face with scattered, outward opening punctures; supraclypeal area and upper half of clypeus with

a brassy tinge, sparsely punctured; lower half of clypeus black, coarsely punctured, fringed with yellowish hairs; mandibles red. Thorax clothed with moderately dense white hairs, more abundant on the sides; mesothorax shining, microscopically lineolate, the punctures about the diameter of a puncture apart; scutellum microscopically tessellate, opaque, with deep punctures; disk of propodeum crescentic, polished posteriorly, rugae almost parallel on the lateral portions of disk, anastomosing medially; truncation not sharply defined but distinct laterally; tegulae red-testaceous, impunctate. Abdomen obovate, impunctate, without distinct hair bands, but segments covered with white subappressed hairs; first abdominal segment punctured on the median portion, the second segment punctured on the base; segments 1-2 sparsely pubescent. Wings clear; anterior wing 4.5 mm. long; stigma and nervures pale testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure near the apex; third submarginal rather gently contracted above, about one and one-half times as long as second on marginal. Legs black with dull white hairs; hind spur pectinate with four moderately long teeth.

Habitat.—White Mountains, New Mexico, July 20, on flowers, *Verbascum thapsus* (C. H. T. Townsend).

Type.—Cat. No. 26413, U.S.N.M.

HALICTUS (CHLORALICTUS) LATUS, new species.

Female.—About 6.5-7 mm. long; head and thorax dark olive green; abdomen black; pubescence yellowish white. Facial quadrangle about as broad as long; orbits converging slightly below; face clothed with moderately dense pubescence; front closely punctured, the punctures more scattered and indistinct below the antennae; supraclypeal area microscopically lineolate, with few deep punctures; clypeus produced little below the lower margins of the eyes, lower half shining black, with few coarse punctures, fringed with yellowish hairs. Thorax clothed with moderately abundant yellowish white hairs; mesothorax broad, shining, microscopically tessellate, with scattered shallow punctures; median and parapsidal grooves deeply impressed; scutellum closely and coarsely punctured, two polished spots on the disk; disk of propodeum crescentic, without an inclosing rim, shining, with coarse plicae extending to the posterior margin, median portion of disk slightly elevated posteriorly, and tessellate; truncation distinct laterally; tegulae rufo-testaceous, impunctate. Abdomen obovate, impunctate; segments 1-2 almost without pubescence, shining; segments 3-5 covered with subappressed yellowish hairs. Anterior wing about 5 mm. long; wings hyaline; stigma and nervures pale testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure very near the apex; third

submarginal sharply contracted above and little longer than second on the marginal. Legs black, with quite abundant yellowish hairs; hind spur pectinate with three moderately long teeth.

Habitat.—Colorado Springs, Colorado, April 20, at flowers of willow (W. P. Cockerell).

Type.—Cat. No. 26414, U.S.N.M.

Distinguished from other *Chloralictus* by the broad head; and from *unicus* by the reddish tegulae, olive-green mesothorax, hind spur with three teeth, darker stigma and nervures.

HALICTUS (CHLORALICTUS) UNICUS, new species.

Female.—About 6.5 mm. long; head and thorax dark blue-green; abdomen black; pubescence largely dull white. Facial quadrangle about as broad as long; orbits converging below; face covered with moderately dense pubescence; front with close shallow punctures; sides of face and supraclypeal area microscopically lineolate, with deep scattered punctures; clypeus largely shining black, with few very coarse punctures, fringed with yellowish hairs; antennae dark, flagellum reddened beneath, especially apically. Thorax clothed with abundant white pubescence; mesothorax broad, microscopically lineolate, with coarse scattered punctures; scutellum sculptured similarly to the mesothorax, two large polished spots on the disk; disk of propodeum crescentic, without an inclosing rim, with few coarse plicae, plicae somewhat wrinkled, especially on the median portion; truncation distinct laterally; tegulae pale testaceous, impunctate. Abdomen broadly obovate, impunctate; first abdominal segment as broad as second; segments 1-2 shining, almost without pubescence; segments 3-5 clothed with dense subappressed yellowish white hairs. Anterior wing 5 mm. long; wings clear; stigma and nervures honey color; second submarginal cell higher than broad, scarcely contracted above, receiving the first recurrent nervure very near the apex; third submarginal very gently contracted above, about twice as long as second on marginal. Legs black, with dense dull white hairs; hind spur pectinate with four moderately long teeth.

Habitat.—Seven miles east of Vinton, Iowa, June 29, 1922 (Sandhouse).

Type.—Cat. No. 26415, U.S.N.M.

Easily distinguished from other *Chloralictus* by the broad head, and from *latus* by the paler tegulae and nervures; blue-green mesothorax; hind spur with four teeth.

HALICTUS (CHLORALICTUS) ABSIMILIS, new species.

Female.—About 6 mm. long; head and thorax blue-green; abdomen black; pubescence white. Facial quadrangle longer than broad; inner orbits converging below; front above the antennae with close

shallow punctures; sides of face, part of the clypeus and supraclypeal area microscopically lineolate, more sparsely punctured; lower part of clypeus black, shining, with a few coarse punctures; flagellum dark testaceous, paler beneath and at the apex. Thorax quite densely pubescent; mesothorax shining, microscopically lineolate, with moderately close, shallow punctures, the punctures closer at the extreme posterior and lateral margins; punctation of scutellum similar to that of the mesothorax, two large polished spots on the disk; disk of propodeum rather long, without a distinct inclosing rim, microscopically tessellate, with more or less discontinuous plicae; truncation distinct laterally; tegulae very pale testaceous, impunctate. Abdomen obovate, shining, impunctate; segments 1-2 with sparse dull white pubescence; segments 3-5 densely clothed with subappressed dull white hairs; apical margins of segments 3-4 testaceous. Anterior wing 4.5 mm. long; wings hyaline; stigma and nervures pale testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure near the apex; third submarginal subquadrate, gently contracted above, little longer than the second on marginal. Legs dark, with dull white hairs; knees and tarsi dark red; hind spur pectinate with four moderately long teeth.

Habitat.—Sterling, Colorado, July 10, 1920, on dandelion (*Taraxacum*) (Sandhouse)

Type.—Cat. No. 26416, U.S.N.M.

HALICTUS (CHLORALICTUS) VINTONENSIS, new species.

Female.—About 5 mm. long; head and thorax olive green; abdomen black; pubescence dull or yellowish white. Facial quadrangle distinctly longer than broad; inner orbits converging gently below; face shining, clothed with quite abundant pubescence, rather closely and delicately punctured; supraclypeal area sparsely punctured; clypeus largely green, sparsely punctured, black below, fringed with yellowish hairs; antennae largely dark, flagellum dark testaceous beneath; mandibles red. Thorax shining with quite abundant pubescence; mesothorax smooth, with very delicate punctures; scutellum with disk largely polished, dull and delicately punctured at posterior margin; disk of propodeum long, without a distinct inclosing rim, microscopically tessellate, with irregular rugae on basal portion only; truncation distinct laterally; tegulae very pale testaceous, impunctate. Abdomen ovate, shining, quite sparsely pubescent, impunctate; apical half of segments 1-2 with bronzen reflections; anterior wing 4.2 mm. long; wings hyaline; stigma and nervures pale testaceous; subcostal nervure very dark; second submarginal cell higher than broad, receiving the first recurrent nervure very near the apex; third submarginal hardly contracted above, almost twice as long as second

on the marginal. Legs black, covered with dense yellowish pubescence; knees and tarsi clear red; hind spur pectinate with four moderately long teeth.

Habitat.—Vinton, Iowa, June 23, 1922 (Sandhouse). Two specimens.

Type.—Cat. No. 26417, U.S.N.M.

HALICTUS (CHLORALICTUS) GAUDIALIS, new species.

Male.—About 4.5 mm. long; head and thorax brilliant blue; abdomen black; pubescence pure white. Face clothed with dense pubescence; facial quadrangle longer than broad; inner orbits converging sharply below; antennae dark brown, flagellum yellow-testaceous beneath, second and third antennal joints of equal length; front closely punctured, the punctures becoming hardly more scattered below antennae and on supraclypeal area; clypeus largely black, produced about two-thirds its length below the eyes, coarsely punctured. Thorax slender, with moderately dense pubescence; mesothorax shining, coarsely and closely punctured; scutellum and metathorax closely punctured; disk of propodeum crescentic, shining, with a low inclosing rim posteriorly, plicae radiating slightly, reaching the apex; mesopleurae coarsely punctured; sides of propodeum punctured; truncation distinct, but not sharply defined laterally; tegulae dark, opaque, with close and deep punctures. Abdomen ovate, black, bases of segments clothed with fine white hairs, delicately punctured; apical margins of segments polished. Wings clear; anterior wing 3.5 mm. long; stigma and nervures testaceous; second submarginal cell twice as high as broad, receiving the first recurrent nervure very near the apex; third submarginal broad at the base, contracted about one-half above, almost twice as long as second on the marginal. Legs black, or very dark brown; tarsi paler brown; pubescence moderately dense.

Habitat.—La Jolla, California, August (Cockerell). Two specimens.

Type.—Cat. No. 26418, U.S.N.M.

HALICTUS (CHLORALICTUS) PAULULUS, new species.

Male.—About 4 mm. long; head and thorax greenish blue; abdomen black; pubescence white. Facial quadrangle distinctly longer than broad; orbits converging sharply below; face clothed with dense white hairs; flagellum brown, rufo-testaceous beneath, second and third antennal joints of equal length; front very closely punctured above the antennae, the punctures more scattered below; clypeus largely black, coarsely punctured. Thorax clothed with moderately abundant pubescence, the hairs longer on the sides; mesothorax shining, with close, coarse punctures, the punctures about the diameter

of a puncture apart; median and parapsidal grooves indistinct; punctation of scutellum similar to that of the mesothorax; disk of propodeum crescentic, dull, finely roughened, rugose at the base only; mesopleurae punctate; truncation distinct laterally; tegulae dark, opaque, coarsely punctured. Abdomen ovate; without distinct hair bands, but segments clothed with quite sparse dull white hairs; apical margins of segments polished, dark testaceous. Wings yellowish; anterior wing 2.75 mm. long; stigma and nervures pale testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure near the apex; third submarginal about one and one-half times as long as the second on the marginal. Legs black, with rather sparse pubescence; tarsi reddish.

Habitat.—Crook, Colorado, August 29, 1920 (Sandhouse).

Type.—Cat. No. 26419, U.S.N.M.

HALICTUS (CHLORALICTUS) EXALBIDUS, new species.

Male.—About 5 mm. long; brilliant blue; pubescence pruinose, abundant. Facial quadrangle about as broad as long; face with long plumose hairs; orbits converging below; second and third antennal joints of equal length, flagellum rufo-testaceous, paler beneath; front with close, deep punctures above the antennae, more sparse below; supraclypeal area and clypeus largely blue, more delicately punctured; the line between the clypeus and supraclypeal area very faint. Mesothorax shining, coarsely punctured; median and parapsidal grooves distinct, but not deeply impressed; punctation of scutellum similar to that of the mesothorax; metathorax shining, punctate; disk of propodeum small, semicircular, with a polished inclosing rim, shining, with irregularly wrinkled rugae; mesopleurae coarsely punctured; sides of propodeum punctured, the punctures extending up to the edge of the disk; truncation distinct laterally, but not sharply defined; tegulae very clear, honey color, impunctate. Abdomen narrowly ovate, segments punctured to the extreme apical margins, which are testaceous. Wings clear; anterior wing 3.5 mm. long; stigma and nervures honey color, except the subcosta and the costa beyond the stigma, which are testaceous; second submarginal cell higher than broad; first recurrent nervure joining second transverso-cubital; third submarginal somewhat broader than high, gently contracted above, about three times as long as second on the marginal. Legs dark, with knees reddened; tarsi testaceous.

Habitat.—Sante Fe, New Mexico, August, No. 4228 (Cockerell).

Type.—Cat. No. 26420, U.S.N.M.

Differs from *albohirtus* Crawford by the more closely punctured mesothorax; sculpturing of the disk of propodeum; broader head.

From *pruinosisiformis* Crawford by the reddened flagellum; more sparse pubescence; broader head.

HALICTUS (CHLORALICTUS) ACTUARIUS, new species.

Male.—About 4.5 mm. long; brilliant blue; pubescence white, sparse. Facial quadrangle distinctly longer than broad; orbits converging slightly below; flagellum testaceous, yellow testaceous beneath; second and third joints of antennae of equal length; front shining, with close, rather delicate punctures above antennae; punctures below and on the supraclypeal area and clypeus delicate, but more scattered; clypeus largely blue; mandibles dark reddish. Mesothorax shining, coarsely punctured, the punctures about twice the diameter of a puncture apart; punctation of the scutellum similar to that of the mesothorax; metathorax punctured; disk of propodeum long, shining, without an inclosing rim, plicate laterally, medially with irregularly anastomosing rugae; pleurae and sides of propodeum coarsely punctured; truncation distinct laterally; tegulae honey color, impunctate. Abdomen narrowly ovate, punctured, very sparsely pubescent; apical margins of segments testaceous; margins of segments 1-2 punctured, of segments 3-5 punctureless. Wings very clear; anterior wing about 3.25 mm. long; stigma and nervures honey color, except the subcostal nervure which is testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure near the apex; third submarginal practically quadrate, little contracted above, more than twice as long as second on the marginal. Legs largely black; knees red; tarsi yellow-testaceous.

Habitat.—Boulder, Colorado, July 31, 1908 (S. A. Rohwer).

Type.—Cat. No. 26421, U.S.N.M.

Differs: From *albohirtus* Crawford by the narrower thorax; less abundant pubescence; sculpturing on the disk of propodeum.

From *pruiniformis* Crawford by the sparse pubescence; more slender abdomen; sculpturing and color of the disk of propodeum.

HALICTUS (CHLORALICTUS) SAGAX, new species.

Male.—About 5.5-6 mm. long; head and thorax olive green; abdomen black; pubescence white. Facial quadrangle longer than broad; inner orbits converging sharply below; face brassy, clothed with dense hairs; flagellum brown, paler beneath; third antennal joint longer than second; front above the antennae sparsely pubescent, very closely punctured, below the antennae so closely covered with plumose hairs that no punctures are apparent; lower half of clypeus and tips of mandibles reddish yellow. Thorax with sparse pubescence; mesothorax and scutellum shining brassy green, smooth, coarsely punctured, the punctures much closer in the region of the median and parapsidal grooves; disk of propodeum shining dark green, with very coarse rugae extending to the posterior margin, thence over the lateral sides and covering the entire posterior surface; truncation

very sharply defined; tegulae pale testaceous, impunctate. Abdomen ovate, shining, sparsely pubescent, with delicate piliferous punctures on the bases of segments; apical margins of segments narrowly testaceous. Wings hyaline, faintly dusky; anterior wing 4 mm. long; stigma and nervures testaceous; subcostal nervure dark; second submarginal cell higher than broad, contracted above; first recurrent nervure joining the second transverso-cubital; third submarginal narrow—that is, higher than broad—about twice as long as the second on the marginal. Legs black with knees, tips of tibiae and tarsi rufo-testaceous; pubescence pure white.

Habitat.—Boulder, Colorado, July 28, and September 12, 1908 (S. A. Rohwer). Two specimens.

Type.—Cat. No. 26422, U.S.N.M.

Quite similar to *disparilis* Crawford, from which it differs by the more sharply converging orbits; yellow clypeus; shape and sculpturing of the disk of the propodeum.

HALICTUS (CHLORALICTUS) PEREXIGUUS, new species.

Male.—About 5 mm. long; head and thorax greenish blue; abdomen brown; pubescence white. Facial quadrangle longer than broad; orbits converging sharply below; eyes bulging, giving the face a circular appearance; antennae rufo-testaceous; second and third joints of antennae of equal length; flagellum yellow-testaceous beneath; front covered with appressed white hairs, above the antennae very closely punctured, below the punctures become more sparse; lower half of clypeus and mandibles yellow; clypeus produced little below the lower margin of the eyes. Thorax with moderately dense pubescence; mesothorax shining, with delicate, moderately close punctures; median and parapsidal grooves distinct, but not deeply impressed; scutellum and metathorax shining, delicately punctured; disk of propodeum long, shining, with irregular rugae not reaching the apex, which is polished; mesopleurae shining, delicately punctured; truncation not sharply defined, but distinct laterally; tegulae very pale, impunctate. Abdomen slender, the only punctures piliferous; bases of segments clothed with rather sparse hairs; apical margins very pale testaceous. Wings clear; anterior wing 4 mm. long; stigma and nervures testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure near the apex; third submarginal little broader than high, contracted above, about equidistant with the second on the marginal. Legs yellow-testaceous; the femora and tibiae somewhat darker; pubescence dull white.

Habitat.—Las Cruces, New Mexico, October 12 (Cockerell).

Type.—Cat. No. 26423, U.S.N.M.

HALICTUS (CHLORALICTUS) OCCULTUS, new species.

Male.—About 6.5 mm. long; head olive green; thorax largely blue-green; abdomen black; pubescence white. Facial quadrangle distinctly longer than broad; orbits converging sharply below; front above the antennae without hairs, very closely punctured, below the antennae the punctures are more scattered and the pubescence is dense; supraclypeal area opaque, microscopically lineolate, sparsely punctured; lower half of clypeus and mandibles very pale yellow; antennae dark testaceous, flagellum testaceous beneath; second and third antennal joints of equal length. Thorax with moderately dense pubescence; mesothorax shining, with delicate punctures, the disk blue, the lateral and posterior margins blue-green; punctation of scutellum similar to that of the mesothorax; disk of propodeum shining blue, laterally with a few coarse plicae which extend over on the sides; the median portion is irregularly rugose; truncation distinct laterally; tegulae dark, impunctate. Abdomen slender, impunctate, sparsely pubescent; the apical margins of the segments testaceous, with microscopic transverse lineolations. Wings clear hyaline; anterior wing 5 mm. long; stigma and nervures testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure near the apex; third submarginal little broader than high, about one and one-half times as long as the second on the marginal. Legs black; knees, apices of tibiae and tarsi yellow; the front legs with tibiae entirely yellow; pubescence on legs short, pure white.

Habitat.—Florissant, Colorado, July 23, at flowers *Potentilla* (Cockerell).

Type.—Cat. No. 26424, U.S.N.M.

Differs: From *hortensis* Lovell by the larger size; brassy face and mesothorax; clear wings; legs black; narrower face.

From *nevadensis* Crawford by the narrower, brassy face; paler flagellum; brassy mesothorax and scutellum; clear wings; sculpturing on disk of propodeum.

HALICTUS (CHLORALICTUS) EVESFIGATUS, new species.

Male.—About 6–6.5 mm. long; head and thorax blue-green; abdomen black; pubescence white. Facial quadrangle somewhat longer than broad; orbits converging slightly below; antennae dark brown, third joint longer than the second; flagellum yellow-testaceous beneath; front above antennae with close, shallow punctures, below sparsely punctured and clothed with dense pubescence; the lower half of the clypeus pale yellow; mandibles dark, red at the apex. Thorax with moderately dense short hairs; mesothorax and scutellum shining, with coarse punctures, the punctures hardly the diameter of a puncture apart; disk of propodeum long, shining, without an inclosing rim;

emarginate posteriorly, with irregularly anastomosing rugae; truncation distinct laterally; tegulae dark, impunctate. Abdomen ovate, shining piceous, sparsely pubescent; the bases of the segments punctate; the apical margins testaceous with microscopic, transverse lineations. Wings hyaline; anterior wing 4.5 mm. long; stigma and nervures dark testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure one-third of the distance from the apex; third submarginal broad, sharply contracted above, about one and one-half times as long as the second on marginal. Legs black; sparsely pubescent; tarsi yellow.

Habitat.—Ward, Colorado, August 10 (Cockerell).

Type.—Cat. No. 26425, U.S.N.M.

HALICTUS (CHLORALICTUS) PIKEI, new species.

Male.—About 7 mm. long; head and thorax brilliant dark blue; abdomen black; pubescence white. Facial quadrangle considerably longer than broad; orbits converging slightly below; antennae dark testaceous, the third joint longer than the second; flagellum yellow-testaceous beneath; face shining, sparsely pubescent; front above the antennae closely punctured, the punctures becoming more sparse below; lower half of clypeus pale yellow; mandibles dark, reddish at the apex. Thorax with short hairs; mesothorax shining, the disk rather coarsely punctured, the punctures about the diameter of a puncture apart; outside the disk, the punctures are more delicate; scutellum greenish blue, shining, delicately punctured; disk of propodeum long, without a distinct inclosing rim, with very irregular rugae extending to the apex; mesopleurae shining, with shallow punctures; truncation distinct laterally; tegulae dark, impunctate. Abdomen ovate, shining, sparsely pubescent; the only punctures piliferous; the bases of the segments 4–5 with a bluish reflection; apical margins of segments brownish. Wings clear hyaline; anterior wing 4.75 mm. long; stigma and nervures dark testaceous; basal nervure strongly bent; second submarginal cell higher than broad, receiving the first recurrent nervure very near the apex; third submarginal about twice as long as the second on the marginal. Legs black, with dull white hairs; knees red; tarsi yellow.

Habitat.—Printing Office, Pikes Peak, Colorado, September 17 (Cockerell).

Type.—Cat. No. 26426, U.S.N.M.

HALICTUS (CHLORALICTUS) ORNUBILUS, new species.

Male.—About 4 mm. long; head and thorax dark blue-green; abdomen black; pubescence white, sparse. Facial quadrangle longer than broad; orbits converging sharply below; antennae dark, second and third joints of equal length; flagellum dark brown, hardly paler

beneath; front above the antennae closely punctured; below the antennae, the supraclypeal area and clypeus with sparse deep punctures; lower half of clypeus black. Mesothorax shining, greenish, with faint microscopic lineolations; outside the disk, the punctures are about the diameter of a puncture apart, on the disk, twice as far apart; scutellum and metathorax shining, punctured; disk of propodeum crescentic, with a low, polished, inclosing rim, shining, with plicae extending to the posterior margin; mesopleurae shining, coarsely punctured; sides of propodeum delicately punctured; truncation distinct laterally; tegulae dark; impunctate. Abdomen slender, shining, the segments delicately punctured, except the apical margins of the segments which are polished; sparsely pubescent. Wings faintly dusky; anterior wing 2.5 mm. long; stigma and nervures dark; second submarginal cell higher than broad; contracted above; first recurrent nervure joining the second transverso-cubital; third submarginal very broad, contracted about one-half above, little longer than second on the marginal. Legs black.

Habitat.—Boulder, Colorado, July 18, 1908 (S. A. Rohwer).

Type.—Cat. No. 26427, U.S.N.M.

Differs: From *ruidosensis* Cockerell by the smaller size: plicae on the disk of propodeum reaching the posterior margin; mesothorax brassy; paler color.

HALICTUS (CHLORALICTUS) INSULSUS, new species.

Male.—About 5 mm. long; head and thorax dark blue; abdomen black; pubescence white, sparse. Facial quadrangle about as broad as long; orbits converging below; antennae dark brown, the second and third joints of equal length; flagellum little paler beneath; front above the antennae very closely punctured; the lower portion of the front, supraclypeal area and clypeus more sparsely punctured; clypeus black, produced more than half its length below the lower margins of the eyes. Mesothorax and scutellum with moderately coarse, shallow punctures, about the diameter of a puncture apart; disk of propodeum without an inclosing rim, plicatulate at the base only, the apex is polished; mesopleurae with shallow punctures; sides of propodeum punctured; truncation not sharply defined, but distinct laterally; tegulae dark, impunctate. Abdomen slender, the only punctures piliferous; the apical margins of segments brownish. Wings faintly dusky; anterior wing 4 mm. long; stigma and nervures dark; the second submarginal cell as broad at the base as it is high, but contracted almost one-half above, receiving the first recurrent nervure very near the apex; third submarginal about twice as long as the second on marginal. Legs black.

Habitat.—Beulah, New Mexico, August 18 (W. Porter).

Type.—Cat. No. 26428, U.S.N.M.

HALICTUS (CHLORALICTUS) CONSONUS, new species.

Male.—About 6.5–7 mm. long; head and thorax very dark blue-green; abdomen black; pubescence white. Facial quadrangle somewhat longer than broad; inner orbits converging sharply below; antennae black, second and third joints of about equal length; flagellum dark testaceous beneath; front above the antennae very closely punctured, the punctures becoming more open and sparse below; supraclypeal area and clypeus microscopically lineolate, sparsely punctured; clypeus black; mandibles black, slightly reddened apically. Thorax with short, rather dense pubescence; mesothorax microscopically tessellate, quite closely punctured, the punctures more sparse on the disk; scutellum punctured; disk of propodeum long, shining, with plicae on the sides, the median portion with irregularly anastomosing rugae, apex polished; truncation distinct laterally; tegulae dark, impunctate. Abdomen shining, sparsely pubescent, narrowly ovate; segments with transverse lineolations; the only punctures piliferous; apical margins of segments polished. Wings faintly dusky; anterior wing 5 mm. long; stigma and nervures dark; second submarginal cell as broad as high, contracted slightly above, receiving the first recurrent nervure near the apex; third submarginal higher than broad, hardly contracted above, about one and one-half times as long as the second on marginal. Legs black, with dull white pubescence, except on the tarsi where it is yellowish.

Habitat.—Colebrook, Connecticut, September 1–7 (W. M. Wheeler).

Type.—Cat. No. 26429, U.S.N.M.

Differs: From *ruidosensis* Cockerell by the shape and sculpturing of the disk of propodeum; impunctate abdomen; flagellum paler beneath.

From *viridatus* Lovell by the darker thorax; more closely punctured mesothorax; sculpturing of disk of propodeum.

HALICTUS (CHLORALICTUS) PRAEPES, new species.

Male.—About 6.5–7 mm. long; head and thorax dark greenish blue; abdomen shining black; pubescence white, rather sparse. Facial quadrangle longer than broad; orbits converging sharply below; antennae dark brown, third joint longer than second; flagellum testaceous beneath; front above the antennae very closely punctured; below, with more scattered, shallow punctures, and covered with dense pubescence; lower portion of clypeus black; clypeus and supraclypeal area without distinct punctures. Mesothorax shining, rather sparsely punctured; scutellum distinctly rounded upward, shining, almost without punctures; disk of propodeum slightly elevated posteriorly, shining, with few rugae extending across the disk and on to the sides of the propodeum, faint reticulations between the rugae; truncation distinctly laterally, but not sharply defined; sides of propodeum rugose; tegulae dark, impunctate. Abdomen slenderly

ovate, shining, impunctate, almost without pubescence; apical margins of segments dark testaceous. Wings quite clear; anterior wing about 4.5 mm. long; stigma and nervures dark testaceous; basal nervure very gently arched; second submarginal cell higher than broad; receiving the first recurrent nervure near the apex; third submarginal not contracted above, about twice as long as the second on marginal. Legs black.

Habitat.—Peaceful Valley, Colorado, 1919 (Cockerell).

Type.—Cat. No. 26430, U.S.N.M.

Differs: From *ruidosensis* Cockerell by the shining, more sparsely punctured mesothorax and scutellum; sculpturing of the disk of propodeum; polished abdomen.

From *viridatus* Lovell by the shining blue head and thorax; more sparsely and delicately punctured mesothorax; impunctate abdomen.

HALICTUS (CHLORALICTUS) ASTUTUS, new species.

Male.—About 7 mm. long; head and thorax largely dark blue-green; abdomen black; pubescence dull white. Facial quadrangle distinctly longer than broad; orbits converging below; face clothed with rather sparse, dull white hairs; front above the antennae without punctures, but rough, giving it a dull appearance; below the antennae, it is sparsely punctured; supraclypeal area and upper half of clypeus microscopically tessellate, sparsely punctured; antennae dark, third joint scarcely longer than the second; flagellum rufo-testaceous beneath. Thorax with moderately dense, long hairs; mesothorax smooth, shining, sparsely and coarsely punctured; scutellum duller, but with similar punctation, two smooth spots on the disk; disk of propodeum crescentic, inclosed by a rim posteriorly, with coarse rugae not quite reaching the apex, which is microscopically tessellate, but the rugae extend over the lateral margins of the disk; upper half of lateral sides and posterior side of propodeum coarsely rugose; truncation clearly defined laterally; tegulae dark, impunctate. Abdomen narrowly ovate, impunctate; apical margins of segments polished and narrowly testaceous; the bases of the segments covered with sparse pubescence. Wings hyaline; anterior wing 5 mm. long; stigma and nervures dark; second submarginal cell higher than broad, contracted above, receiving the first recurrent nervure very near the apex; third submarginal higher than broad, hardly contracted above, twice as long as the second on marginal. Legs black, with yellowish white pubescence; tarsi somewhat reddened.

Habitat.—Beulah, New Mexico, August 18 (W. Porter).

Type.—Cat. No. 26431, U.S.N.M.

Differs: From *ruidosensis* Cockerell by the shining, more sparsely punctured mesothorax; shape and sculpturing of the disk of propodeum; impunctate abdomen.

From *viridatus* Lovell by the shining blue, more sparsely punctured mesothorax; dusky wings; disk of propodeum plicate at the base only; impunctate abdomen.

HALICTUS (CHLORALICTUS) ABUNDUS, new species.

Male.—About 7 mm. long; head and thorax dark blue; abdomen black; pubescence short, dull white. Facial quadrangle distinctly longer than broad; orbits converging sharply below; face with sparse pubescence; front above the antennae closely punctured, below, more sparsely punctured; supraclypeal area and clypeus microscopically lineolate and coarsely punctured; antennae dark reddish brown, second and third joints of equal length; flagellum ferruginous beneath. Thorax with quite dense pubescence; mesothorax microscopically lineolate, coarsely punctured; disk of scutellum with two large polished spots; disk of propodeum nearly crescentic, shining, with coarse irregularly anastomosing rugae reaching the apex, at the sides the rugae extend on to the sides of the propodeum; posterior side of propodeum coarsely rugose; truncation clearly defined; tegulae ferrugino-testaceous, impunctate. Abdomen ovate, polished, very sparsely pubescent; segments with apical margins polished. Wings reddish, hyaline; stigma and nervures red-testaceous; anterior wing 5.5 mm. long; second submarginal cell higher than broad, receiving the first recurrent nervure very near the apex; third submarginal hardly broader than high, about one and one-half times as long as the second on marginal. Legs black, sparsely pubescent; tarsi reddish.

Habitat.—Beulah, New Mexico, end of August (Cockerell and Porter). Seven specimens.

Type.—Cat. No. 26432, U.S.N.M.

Differs: From *ruidosensis* Cockerell by the more sparsely punctured mesothorax; sculpturing of the disk of propodeum; flagellum paler beneath; wings lighter; tarsi reddened; abdomen obovate, not punctured.

From *viridatus* Lovell by the paler flagellum; yellowish pubescence; mesothorax tessellate, more closely punctured; wings and tegulae reddened.

HALICTUS (CHLORALICTUS) TRANQUILLUS, new species.

Male.—About 7 mm. long; head and thorax blue; abdomen black; pubescence white, sparse. Facial quadrangle longer than broad, orbits converging below; face above the antennae very closely punctured; the punctures below and on the sides of the face more sparse; clypeus and supraclypeal area microscopically tessellate, with sparse, deep punctures; antennae dark, second and third joints of equal length;

flagellum testaceous beneath. Mesothorax and scutellum opaque, microscopically tessellate; the disk sparsely punctured; outside the disk the punctures are about the diameter of a puncture apart; disk of propodeum dull, slightly elevated posteriorly, microscopically tessellate between irregular rugae; the rugae extend on to the sides of the propodeum; truncation distinct laterally; tegulae dark, impunctate. Abdomen ovate, shining, impunctate; very sparsely pubescent; apical margins of segments polished, narrowly testaceous. Wings hyaline; anterior wing 5.25 mm. long; stigma and nervures dark; second submarginal cell higher than broad, receiving the first recurrent nervure a little distance from the apex; third submarginal subquadrate, hardly contracted above, about one and one-third times as long as the second on the marginal. Legs black, with yellowish hairs; tarsi reddish.

Habitat.—Santa Fe, New Mexico, July (Cockerell). No. 3467; on *Linum lewisii*.

Type.—Cat. No. 26433, U.S.N.M.

HALICTUS (CHLORALICTUS) PUDICUS, new species.

Male.—About 6.5 mm. long; head and thorax dark blue; abdomen black; pubescence pure white, sparse. Facial quadrangle longer than broad; orbits converging slightly below; front above the antennae with close, shallow punctures; the punctures becoming more sparse below, and at the sides of the face which is greenish; clypeus and supraclypeal area microscopically tessellate, delicately punctured; apices of mandibles red; antennae dark, second and third joints of equal length; flagellum testaceous beneath. Mesothorax opaque, microscopically tessellate, with punctures about the diameter of a puncture apart, and more scattered on the disk; punctation of scutellum similar to that of the mesothorax, two shining spots on the disk; disk of propodeum crescentic, shining, plicate, the plicae somewhat discontinuous and extending over the margin on to the sides; truncation distinct laterally, but not sharply defined; tegulae dark, impunctate. Abdomen narrowly ovate, shining, impunctate, very sparsely pubescent; apical margins of the segments polished, narrowly testaceous. Wings hyaline; anterior wing 5 mm. long; stigma and nervures dark testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure very near the apex; third submarginal as high as broad, contracted sharply above, about equidistant with the second on the marginal. Legs black; knees somewhat reddened; tarsi yellow.

Habitat.—Longs Peak, Colorado, August, at flowers gentian (Cockerell).

Type.—Cat. No. 26434, U.S.N.M.

HALICTUS (CHLORALICTUS) LACTINEUS, new species.

Male.—About 6 mm. long; head and thorax greenish blue; abdomen black; pubescence pure white. Facial quadrangle longer than broad; orbits converging slightly below; the entire face, clypeus and supradypeal area closely punctured; lower half of clypeus black; mandibles red at the apex; antennae dark, third joint longer than the second; flagellum rufo-testaceous beneath. Thorax densely pubescent; mesothorax somewhat polished, microscopically lineolate, very coarsely punctured, the punctures about the diameter of a puncture apart; the disk with more scattered punctures; scutellum closely punctured, with two large polished spots on the disk; disk of propodeum crescentic, shining, the plicae extending to the posterior margin which is sharply elevated; at the sides the plicae extend on to the lateral sides of the propodeum; mesopleurae with coarse shallow punctures; truncation sharply defined laterally; tegulae honey color, impunctate. Abdomen ovate, apical margins of segments somewhat polished, narrowly testaceous; segments 1-3 delicately punctured, quite sparsely pubescent; segments 4-5 with piliferous punctures only, pubescence more abundant. Wings milky white; anterior wing 4.25 mm. long; stigma and nervures honey color; the second submarginal cell much higher than broad, receiving the first recurrent nervure very near the apex; third submarginal broad at the base, contracted above, at least twice as long as the second on the marginal. Legs black; knees, apices of tibiae and tarsi yellow.

Habitat.—Boulder, Colorado, August 4, 1908 (S. A. Rohwer).

Type.—Cat. No. 26435, U.S.N.M.

Differs: From *albipennis* Robertson by the more sparsely punctured mesothorax; sculpturing of the disk of propodeum; smaller size; paler tegulae; wings more milky white.

From *connexus* Crawford by the more coarsely punctured mesothorax; sculpturing of the disk of propodeum; paler tegulae and wings; color of head and thorax.

HALICTUS (CHLORALICTUS) CALLIDUS, new species.

Male.—About 5.5 mm. long; head and thorax golden green; abdomen black; pubescence pure white. Facial quadrangle longer than broad; orbits converging slightly below; face clothed with very dense pubescence, closely punctured; antennae dark, second and third joints of equal length; flagellum testaceous beneath; mandibles pale reddish. Thorax with dense, short pubescence; mesothorax opaque, microscopically tessellate, closely punctured, punctures laterally contiguous, on the disk the punctures are a little more than the diameter of a puncture apart; punctation of the scutellum similar to that of the mesothorax; disk of propodeum crescentic, shining,

plicate, the plicae reaching the broad, low posterior rim; at the sides the plicae extend over the margin on to the lateral sides of the propodeum; mesopleurae with coarse, shallow punctures; truncation sharply defined laterally; tegulae pale testaceous, impunctate. Abdomen ovate, with rather close, short hairs; apical margins of segments with faint, transverse lineolations, testaceous; segments 1-3 closely punctured; segments 4-5 with piliferous punctures only. Wings clear; anterior wing 4.5 mm. long; stigma and nervures very pale testaceous; subcostal nervure very dark; basal nervure very strongly bent; second submarginal cell higher than broad; the first recurrent nervure joining the second transverso-cubital; third submarginal broad, contracted above, about one and one-half times as long as the second on the marginal. Legs black; knees and tips of tibiae and tarsi yellow.

Habitat.—East Falls Church, Virginia, July 20 (S. A. Rohwer), at flowers *Daucus carota*.

Type.—Cat. No. 26436, U.S.N.M.

Differs: From *hortensis* Lovell by the larger size; paler wings; head and thorax golden green; punctured abdomen; sculpturing of the disk of propodeum.

From *disparilis* Crawford by the narrower face; opaque, more closely punctured mesothorax and scutellum; sculpturing of the disk of propodeum; abdomen closely punctured, with greenish reflections.

HALICTUS (CHLORALICTUS) APERTUS, new species.

Male.—About 5 mm. long; head and thorax dark blue; abdomen black; pubescence white. Facial quadrangle longer than broad; orbits converging sharply below; face clothed with quite dense pubescence; front above the antennae very closely punctured, the punctures more sparse below and on the sides of the face; punctures sparse on the supraclypeal area and clypeus, which are dull and microscopically tessellate; anterior margin of clypeus obscurely yellowish; third joint of antennae longer than second; flagellum dark testaceous, paler beneath. Thorax with close, short hairs; mesothorax and scutellum opaque, microscopically tessellate, appearing almost finely granular, very closely punctured, the punctures more sparse on the disk; disk of propodeum crescentic, shining, with microscopic transverse lineolations between the plicae, which reach the apex; the plicae extend on to the sides of the propodeum; truncation distinct laterally; tegulae very pale testaceous, impunctate. Abdomen obovate, densely pubescent, with delicate piliferous punctures; apical margins of segments microscopically lineolate; testaceous. Wings hyaline; about 3.5 mm. long; stigma and nervures testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure a little distance from

the apex; third submarginal subquadrate, contracted little above, hardly longer than the second on the marginal. Legs black; knees, tips of tibiae, and tarsi reddish yellow.

Habitat.—East Falls Church, Virginia, July 22; and Chain Bridge, Virginia, (type locality), June 14 (S. A. Rohwer). Two specimens.

Type.—Cat. No. 26437, U.S.N.M.

Differs from *hortensis* Lovell by more robust species; mesothorax opaque, closely punctured; orbits converging more sharply below; paler flagellum; sculpturing of the disk of propodeum; paler wings.

HALICTUS (CHLORALICTUS) GENUINUS, new species.

Male.—About 5.5 mm. long; head and thorax blue-green; abdomen black; pubescence white. Facial quadrangle somewhat longer than broad; orbits converging below; face densely pubescent; front above the antennae closely punctured, the punctures becoming more sparse below; antennae dark, the second and third joints of equal length; flagellum testaceous beneath; mandibles red at the apex. Thorax with quite dense, short hairs, mesothorax opaque, microscopically tessellate, very closely punctured, the punctures on the disk about twice as far apart; punctation of the scutellum similar to that of the mesothorax; two smooth spots on the disk; disk of propodeum crescentic, shining, inclosed posteriorly by a low rim, plicae reaching the posterior margin and extending on the sides of the propodeum; truncation distinct laterally; tegulae testaceous, impunctate. Abdomen narrowly ovate; apical margins of segments transversely lineolate; bases of segments with delicate piliferous punctures and dense, short hairs. Wings clear hyaline; anterior wing 4.25 mm. long; stigma and nervures pale testaceous; second submarginal cell higher than broad, contracted above, receiving the first recurrent nervure a little distance from the apex; third submarginal almost as broad as high, contracted above, one and one-half times as long as the second on the marginal. Legs black, with quite abundant hairs; knees, tips of tibiae, and tarsi reddened.

Habitat.—Chain Bridge, Virginia, June 14 (S. A. Rohwer).

Type.—Cat. No. 26438, U.S.N.M.

Differs from *hortensis* Lovell by the larger, more robust size; darker flagellum; more closely punctured mesothorax; darker tegulae; sculpturing of the disk of propodeum.

HALICTUS (CHLORALICTUS) BASILICUS, new species.

Male.—About 5.5–6 mm. long; head and thorax blue-green; abdomen black; pubescence white. Facial quadrangle considerably longer than broad; orbits converging sharply below; entire face closely punctured and clothed with dense pubescence; antennae dark, second and

third joints of equal length; flagellum testaceous beneath; lower half of clypeus black. Thorax with quite dense, short hairs; mesothorax shining, with faint microscopic lineolations, coarsely and deeply punctured, the punctures about twice as far apart on the disk; punctation of the scutellum similar to that of the mesothorax, two large, shining spots on the disk; disk of propodeum subcrescentic, shining, with coarse, irregular rugae extending over the margin and covering the sides of propodeum; mesopleurae with coarse, shallow punctures; truncation sharply defined laterally; tegulae honey color, impunctate. Abdomen ovate, shining, very sparsely pubescent; segments 1-2 delicately punctured; apical margins of segments polished, dark testaceous. Wings clear; anterior wing 4 mm. long; stigma and nervures very pale testaceous; second submarginal cell considerably higher than broad, receiving the first recurrent nervure near the apex; third submarginal higher than broad, about twice as long as the second on marginal, receiving the second recurrent nervure near the apex. Legs shining, black, with moderately close hairs; knees, tips of tibiae, and tarsi yellow.

Habitat.—Colebrook, Connecticut, September 1-7 (W. M. Wheeler).

Type.—Cat. No. 26439, U.S.N.M.

Differs: From *hortensis* Lovell by the larger size; narrower face; clear wings; more abundant pubescence; sculpturing of the disk of propodeum.

From *nevadensis* Crawford by the narrow face; paler flagellum and tegulae; clear wings; sculpturing of the disk of propodeum; broader, polished abdomen; knees red; tarsi clear yellow.

HALICTUS (CHLORALICTUS) MACTUS, new species.

Male.—About 5 mm. long; head and thorax dark blue-green; face, mesothorax, scutellum, and mesopleurae with a brassy tinge; abdomen black; pubescence white. Facial quadrangle little longer than broad; orbits converging slightly below; face shining, sparsely pubescent; front closely punctured, the punctures more scattered and shallow below; antennae dark, second and third joints of equal length; flagellum testaceous beneath; lower half of clypeus shining black, sparsely punctured. Thorax with short, rather dense pubescence; mesothorax polished, with deep punctures a little more than the diameter of a puncture apart; punctation of scutellum much like that of the mesothorax, two smooth spots on the disk; metathorax shining, punctured; disk of propodeum dark blue, long, inclosed posteriorly by a low rim, with very irregular, discontinuous rugae; mesopleurae shining, coarsely punctured; truncation well defined laterally; tegulae red-testaceous, impunctate. Abdomen narrowly ovate; segments except for a very narrow, polished apical margin, with delicate, piliferous punctures and short hairs. Wings clear; anterior wing

3.75 mm. long; stigma and nervures pale testaceous; second submarginal cell higher than broad, the first recurrent nervure joining the second transverso-cubital; third submarginal broad below, contracted above, little longer than the second on marginal. Legs black; tarsi with yellowish hairs.

Habitat.—Longs Peak Trail, Colorado, July 18 at flowers *Senecio* (W. P. Cockerell).

Type.—Cat. No. 26400, U.S.N.M.

HALICTUS (CHLORALICTUS) PENSITUS, new species.

Male.—About 5 mm. long; head and thorax blue-green; abdomen black; pubescence white. Facial quadrangle longer than broad; orbits converging below; face shining, rather densely pubescent; front closely punctured; the punctures more scattered below; clypeus sparsely punctured, lower half black; antennae brown, second and third joints of equal length; flagellum dark testaceous beneath. Thorax densely pubescent; mesothorax shining, with punctures about the diameter of a puncture apart, a little more scattered on the disk; punctation of scutellum similar to that of the mesothorax; two polished spots on the disk; disk of propodeum long, shining, with more or less irregular plicae not quite reaching the apex, which is polished; mesopleurae coarsely punctured; truncation distinct laterally; tegulae dark, impunctate. Abdomen narrowly ovate; apical margins of segments very narrowly testaceous, polished; bases of segments delicately punctured, clothed with quite abundant pubescence. Wings clear; anterior wing 3.75 mm. long; stigma and nervures pale testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure near the apex; third submarginal contracted about one-half above, hardly longer than the second on the marginal, receiving the second recurrent nervure about one-fourth from the apex. Legs black.

Habitat.—Boulder, Colorado, July 20 to August 1, 1908 (S. A. Rohwer). Four specimens.

Type.—Cat. No. 26441, U.S.N.M.

Differs from *hortensis* Lovell by the larger size; more abundant pubescence; clear wings; reddish tegulae; head and thorax blue-green; sculpturing of the disk of propodeum; legs black.

From *nevadensis* Crawford by the clear wings; abundant pubescence; sculpturing of the disk of propodeum.

HALICTUS (CHLORALICTUS) ACCENTUS, new species.

Male.—About 6 mm. long; head and thorax olive green; abdomen black; pubescence white. Facial quadrangle longer than broad; orbits converging below; antennae dark, third joint somewhat longer than second; flagellum rufo-testaceous; front very closely punctured; below the punctures are more scattered; clypeus closely punctured; the anterior margin of clypeus and mandibles chrome-orange.

Thorax with rather dense pubescence; mesothorax polished, closely punctured, the punctures about the diameter of a puncture apart except on the disk where they are about twice as far apart; punctation of the scutellum similar to that of the mesothorax; disk of propodeum dark green, subrescentic, shining, with coarse plicae reaching the apex, inclosed by a low, irregular rim; truncation distinct laterally; tegulae very pale testaceous, impunctate. Abdomen ovate, shining; apical margins of segments polished; bases of segments with delicate piliferous punctures, clothed with short hairs. Wings clear, faintly yellowish; anterior wing 4.5 mm. long; stigma and nervures pale testaceous; second submarginal cell higher than broad; first recurrent nervure joining the second transverso-cubital; third submarginal broader than high, contracted above, one and one-half times as long as second on marginal. Legs black; knees, tips of tibiae, and tarsi yellowish.

Habitat.—Boulder, Colorado, August 1, 1908 (S. A. Rohwer); University Campus (Cockerell) (type).

Type.—Cat. No. 26442, U.S.N.M.

Differs: From *hortensis* Lovell by the larger, more robust size; narrower face; face and mesothorax golden green; flagellum rufo-testaceous beneath; sculpturing of the disk of propodeum; paler wings.

From *nevadensis* Crawford by the narrower face; flagellum pale beneath; mandible yellowish; paler tegulae; sculpturing of the disk of propodeum; mesothorax more delicately punctured; knees and tarsi yellowish.

From *disparilis* Crawford by the more sharply converging orbits; face more closely punctured; more delicately punctured mesothorax; less brassy face and mesothorax; sculpturing of the disk of propodeum.

HALICTUS (CHLORALICTUS) MOLLIS, new species,

Male.—About 5.5 mm. long; head and thorax blue-green; abdomen black; pubescence white. Facial quadrangle longer than broad; orbits converging slightly below; face sparsely pubescent; front closely punctured; the punctures more sparse below; clypeus brassy, the lower one-third black; antennae dark, second and third joints of equal length; flagellum dark, hardly paler beneath; mandibles dark; red at the apex. Thorax with quite dense, long hairs; mesothorax polished; punctures on the mesothorax about the diameter of a puncture apart, more sparse on the disk; scutellum closely punctured. two polished spots on the disk; disk of propodeum long, with irregularly anastomosing rugae reaching the apex, which is polished; mesopleurae and sides of propodeum coarsely punctured, brassy; truncation not sharply defined laterally; tegulae very pale; impunctate.

Abdomen ovate, polished; segments punctured, sparsely pubescent. Wings clear; anterior wing 4 mm. long; stigma and nervures pale testaceous; second submarginal cell much higher than broad, receiving the first recurrent nervure near the apex; third submarginal broad, more than twice as long as the second on marginal. Legs black; knees somewhat reddened; tarsi brownish, with yellowish hairs.

Habitat.—Florissant, Colorado, July 16 at flowers *Dasiphora fruticosa* (Cockerell).

Type.—Cat. No. 26443, U.S.N.M.

Differs from *nevadensis* Crawford by the pale tegulae; clear wings; shining, more sparsely pubescent abdomen; margins of abdominal segments dark; sculpturing of the disk of propodeum.

HALICTUS (CHORALICTUS) MEROSUS, new species.

Male.—About 5 mm. long; head and thorax dark blue; abdomen dark brown; pubescence white. Facial quadrangle longer than broad; orbits converging sharply below; face quite densely pubescent; front with close, but shallow punctures; the punctures are more sparse below; second and third joints of equal length; flagellum dark testaceous; yellow-testaceous beneath; mandibles reddish. Thorax sparsely pubescent; mesothorax polished, with sparse, delicate punctures; scutellum delicately punctured, with two large, polished spots on the disk; disk of propodeum very dark blue, subrescendent, shining, with a few irregular plicae reaching the apical margin; pleurae very rough; truncation distinct laterally; tegulae pale, impunctate. Abdomen ovate, shining; apical margins polished, testaceous; bases of segments sparsely pubescent. Wings yellowish; anterior wing 3.25 mm. long; stigma and nervures testaceous; second submarginal cell higher than broad, contracted about one-half above, receiving the first recurrent nervure near the apex; third submarginal higher than broad, contracted above, more than twice as long as second on marginal. Legs dark brown, with dull white hairs; knees, tips of tibiae, and tarsi yellow.

Habitat.—Santa Fe, New Mexico, September 21, No. 5608 (Cockerell).

Type.—Cat. No. 26444, U.S.N.M.

Differs from *microlepidoides* Ellis by the paler flagellum; delicately punctured mesothorax; sculpturing of the disk of propodeum; brownish legs and abdomen; darker wings.

HALICTUS (CHLORALICTUS) MALINUS, new species.

Male.—About 5.5 mm. long; head and thorax blue-green; abdomen dark brown; pubescence white. Facial quadrangle little longer than broad; orbits converging sharply below; entire face densely pubescent; front closely punctured; the punctures more scattered below; second

and third antennal joints of equal length; flagellum testaceous, yellowish beneath; mandibles somewhat orange-yellow. Thorax with moderately dense pubescence; mesothorax shining, delicately punctured; scutellum with similar punctation; two polished spots on the disk; disk of propodeum dark green, crescentic, shining, with irregularly anastomosing rugae covering the entire area; tegulae honey color, impunctate; truncation not sharply defined, but distinct laterally. Abdomen ovate, impunctate; apical margins of segments transversely lineolate, testaceous; bases of segments clothed with rather abundant pubescence. Wings clear; anterior wing 3.5 mm. long; stigma and nervures very pale testaceous; second submarginal cell higher than broad, receiving the first recurrent nervure a little distance from the apex; third submarginal subquadrate, little contracted above, almost twice as long as the second on marginal. Legs brown; knees, tips of tibiae, and tarsi yellow.

Habitat.—East Falls Church, Virginia, July 16, at flowers *Cicuta maculata* and July 20, at flowers *Daucus carota* (type). Two specimens (S. A. Rohwer.)

Type.—Cat. No. 26445, U.S.N.M.

Differs: From *hortensis* Lovell by the narrower face; paler wings and tegulae; paler flagellum; sculpturing of the disk of propodeum; mesothorax more closely punctured.

From *nevadensis* Crawford by the more delicately punctured mesothorax; flagellum pale beneath; sculpturing of the disk of propodeum; abdomen brown, the only punctures piliferous; legs brown, with knees and tarsi yellowish.

HALICTUS (CHLORALICTUS) INSOLITUS, new species.

Male.—About 4.5–5 mm. long; head and thorax green; abdomen black; pubescence white. Facial quadrangle longer than broad; orbits converging slightly below; front with very close, but shallow punctures; below the punctures are more sparse; clypeus largely black, quite closely punctured; antennae dark, third joint hardly longer than the second; flagellum rufo-testaceous beneath; mandibles reddish yellow. Thorax with moderately close, short hairs; mesothorax microscopically lineolate, closely and delicately punctured; punctation of scutellum similar to that of the mesothorax; disk of propodeum subcrescentic, with irregular rugae reaching the apex, which is slightly elevated; truncation distinct laterally; tegulae very pale testaceous, impunctate. Abdomen slender, shining, impunctate; apical margins of segments polished, testaceous; bases of segments clothed with sparse, short hairs. Wings faintly dusky; anterior wing 3.5 mm. long; stigma and nervures testaceous; second submarginal higher than broad; first recurrent nervure meeting the second transverso-cubital; third submarginal contracted about one-third

above, receiving the second recurrent nervure near the apex; twice as long as the second on marginal. Legs black, shining; knees, tips of tibiae, and tarsi yellow.

Habitat.—Vinton, Iowa, June 23, 1922 (Sandhouse).

Type.—Cat. No. 26446, U.S.N.M.

Differs from *exiguus* Smith by the paler flagellum; more slender species; head and thorax not so brassy; sculpturing of the disk of propodeum.

NEW LOCALITY RECORDS OF DESCRIBED SPECIES.

The following records are new:

HALICTUS EURYCEPS Ellis.

New Mexico: 3 females, Beulah, August 25, 1899 (W. Porter).

HALICTUS SUBCONNEXUS Ellis.

New York: 1 female, Garrison (Eleth Cattell).

HALICTUS PRUINOSIFORMIS Crawford.

Colorado: 1 female, 4 miles north of Boulder, June 18 at flowers *Petalostemon oligophyllus* (T. and W. Cockerell); 1 female, Colorado Springs (Cockerell).

HALICTUS LAZULIS Ellis.

Colorado: 1 female, Longs Peak Inn, June 25 (Cockerell).

HALICTUS PAVONINUS Ellis.

Colorado: 1 female, Longs Peak Inn, June 26 (Cockerell).

HALICTUS SUCCINIPENNIS Ellis.

Colorado: 1 female, Boulder, April 14, 1907, at flowers *Physaria* (S. A. Rohwer); 1 female, Boulder, May 21, 1922 (Elsie M. Foster).

HALICTUS EOPHILUS Ellis.

New Mexico: 1 female, Albuquerque, May 10, No. 1271 (Cockerell).

HALICTUS STULTUS Cresson.

New Mexico: 1 female, Cockerell No. 706; 2 females, Mesilla, May 9-10, on *Actinella richardsoni* and *Erigeron divergens* (Cockerell).

HALICTUS SPARSUS Robertson.

Iowa: 4 females, Vinton, June 23, 1922 (Sandhouse).

Virginia: 2 females, East Falls Church, May 7 and July 16 at flowers *Cicuta maculata* (S. A. Rohwer).

New Mexico: 4 females, Santa Fe, July and August at *Linum lewisii* and *Lepachys* Cockerell Nos. 3469, 3472, 3387, and 3936; 3 females, Las Vegas, July 22 and August 14 at *Grindelia squamosa* and *Cleome* (W. Porter and Cockerell); 2 females, Pecos, June 15, and July 8 (W. Porter) and (Graham).

Colorado: 1 female Manitou, April 28 on *Salix* (Cockerell).

HALICTUS ALBIPENNIS Robertson.

Colorado: 1 female, Boulder, May 21, 1922 (Elsie M. Foster); 1 female, June 18, at *Petalostemon oligophyllus* (T. and W. Cockerell).

HALICTUS BRUNERI Crawford.

Iowa: 2 females, Vinton, June 29, 1922 (Sandhouse).

HALICTUS PERPUNCTATUS Ellis.

Colorado: 1 female, Boulder, May 20, 1922 (F. D. Becker).

HALICTUS CRESSONII Robertson.

New York: 1 female, Garrison (Eleth Cattell).

HALICTUS VERSATUS Robertson.

Iowa: 1 female, Vinton, June 29, 1922 (Sandhouse).

HALICTUS OBLONGUS Lovell.

Colorado: 2 females, Boulder, May 9, 1907, at flowers *Taraxacum* (S. A. Rohwer); 1 male, Peaceful Valley, August (Cockerell).

New Mexico: 3 females, Santa Fe, July and August, one on *Pentstemon* Cockerell Nos. 3825, 4227, and 4394; 1 female, Pecos, June 24 (W. P. Cockerell); 1 female, Las Vegas, April 20, at flowers of wild plum (Cockerell).

Connecticut: 1 male, Colebrook, September 1 (W. M. Wheeler).

HALICTUS NYMPHAEARUM Robertson.

Massachusetts: 1 male, Woods Hole, (Eleth Cattell).

HALICTUS HORTENSIS Lovell.

Massachusetts: 1 male, Forest Hills, May 14 (collector not known).

New York: 1 female, Garrison, (Eleth Cattell).

Virginia: 3 males, East Falls Church, July 16–20 at flowers of *Daucus carota* and *Cicuta maculata* (S. A. Rohwer).

HALICTUS INCOMPLETUS Crawford.

New Mexico: 1 male, Aztec, September 19, 1898 (C. E. Mead).

HOOKWORMS OF THE GENUS *UNCINARIA* OF THE DOG, FOX, AND BADGER.

B. H. RANSOM,

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Museum.*

Looss in 1911 described, as a new species which he named *Uncinaria polaris*, a hookworm from *Vulpes lagopus*, North America. In the same paper he redescribed *Uncinaria criniformis* originally reported by Goeze in 1782 from the European badger (*Meles taxus*). Furthermore, he concluded that *Uncinaria stenocephala* (Railliet) whose type host is the dog in Europe is identical with *U. criniformis*. The specimens (at least 12 in number) from which *U. polaris* was described were sent to Looss by Stiles many years previously (Looss, 1911, p. 194). The original material, Looss states (p. 213), bore the number 3250 and came from the Zoological Gardens, Washington, D. C. The number 3250 evidently refers to a catalogue number of the Helminthological Collection of the United States National Museum, inasmuch as there are in these collections at the present time, labeled with this number, numerous specimens of hookworms which according to the label were collected from *Vulpes lagopus* at Washington, D. C., by Hassall, August, 1901. These specimens so far as I have examined them are all of one species and correspond closely to Looss's description of *Uncinaria polaris*. Undoubtedly Looss's specimens came from this lot of material and unquestionably the specimens now in the Museum Collections under the catalogue number 3250 belong to Looss's species, *Uncinaria polaris*.

It does not appear in Looss's paper whether he actually examined specimens of *Uncinaria* from dogs before arriving at the conclusion that *Uncinaria stenocephala* is identical with *U. criniformis*. Although he states in general terms that "*Uncinaria criniformis* is common in canine animals in various parts of Europe" (p. 194) and that it occurs "in various Canidae and Mustelidae of mid and northern Europe" (p. 213), he does not say specifically that he has studied specimens from dogs. On the other hand he refers definitely to *Uncinaria criniformis* from *Meles taxus* (p. 607) in connection with his drawings (figs. 105 and 106a) of the mouth-capsule of this species.

In any case, irrespective of the possibility of the occurrence of the species, which Looss calls *U. criniformis*, in dogs, there is unquestionably another species common in European dogs, which Railliet has called *Uncinaria stenocephala*, that is distinctly different from *U. criniformis* of *Meles taxus*. Furthermore *Uncinaria stenocephala* instead of being the same species as *U. criniformis* is in reality the same as *U. polaris*. Not only does Railliet's description of *U. stenocephala* in certain important respects (size of worms, maximum length of spicules, and tridigitation of terminal branches of dorsal ray of bursa) agree with what is found in the specimens of *Uncinaria polaris* (U. S. N. M., 3250) and differing in these respects from what is found in *U. criniformis*, but specimens of *Uncinaria* from dogs in various parts of Europe corresponding to Railliet's description of *Uncinaria stenocephala* agree among themselves and with *U. polaris* and differ from *U. criniformis* as described by Looss and as shown by several lots of specimens from *Meles taxus*. For European specimens of *U. stenocephala* from dogs and *U. criniformis* from *Meles taxus* to compare with *U. polaris* I am indebted to Prof. P. Ciurea, Bucurest, Rumania; Prof. A. Henry, Alfort, France; Prof. J. E. W. Ihle, Utrecht, Holland, and Prof. T. Pintner, Vienna, Austria.

Readily recognizable differences between the two species involved, *Uncinaria criniformis* and *U. stenocephala*, including its synonym, *U. polaris*, are shown in the following brief descriptions. The descriptions are not intended to be complete but refer specially to characters that seem useful for diagnostic purposes.

UNCINARIA CRINIFORMIS (Goeze, 1782).

Specific diagnosis.—*Uncinaria*: Male about 5.5 (5.3 to 5.9) mm., female about 7.5 (6.8 to 8.2) mm. long. The ventral wall of the mouth capsule when viewed in optical section from the side is only slightly curved as a rule (fig. 9). The boundary line between the thicker ventral portion and the thinner dorsal portion of the mouth capsule wall (side view) turns forward along the ventral side of the cord of tissue which terminates in the lateral cephalic papilla, and meets the anterior border of the mouth capsule almost at right angles (fig. 9; α). Esophagus of male about 0.55 mm. long, of female about 0.6 mm. long. Lateral lobes of male bursa only a little more than semicircular in shape. Medio-lateral ray slightly thicker than the postero-lateral ray and much thicker than the externo-lateral ray (fig. 10). Dorsal ray bifurcated distally, each branch bidigitate (fig. 11). Spicules 0.46 to 0.63 mm. long with rounded membranous tips. Tail of female 125 to 135 μ long; tip of tail into which the caudal bristle is inserted almost ogival in outline (fig. 12). Vulva 4.5 to 5.5 mm. from anterior end of body.

Parasitic in intestine of *Meles taxus* in Europe. Not certainly known as yet to occur in other animals.

UNCINARIA STENOCEPHALA (Railliet, 1894).

Synonym.—*Uncinaria polaris* Looss, 1911.

Specific diagnosis.—*Uncinaria*: Male about 7 (5.6 to 8.5) mm., female about 10 (7.7 to 12) mm. long. The ventral wall of the mouth capsule when viewed in optical section from the side is considerably curved as a rule (figs. 1, 5). The boundary line between the thicker ventral portion and the thinner dorsal portion of the mouth capsule wall (side view) anteriorly continues to curve toward the dorsum and meets the anterior border of the mouth capsule obliquely after crossing the cord of tissue which terminates in the lateral cephalic papilla (figs. 1, 5, *x*). Esophagus of male about 0.75 mm., of female about 0.85 mm. long. Lateral lobes of male bursa rather long, considerably more semi-oval than semicircular in shape. Medio-lateral ray of about the same width as the externo-lateral ray and the postero-lateral ray (figs. 2, 6). Dorsal ray bifurcated distally, each branch tridigitate (figs. 3, 7). Spicules 0.64 to 0.76 mm. long with sharply pointed tips. Tail of female 150 to 290 μ long; tip of tail, into which the caudal bristle is inserted, bluntly rounded (figs. 4, 8). Vulva 5 to 7.5 mm. from anterior end of body.

Parasitic in the intestine of the dog in Europe (type host and type locality). Common in fur foxes in Northern North America. Has also been found in the dog in Alaska (Hadwen) and in the hog (in stomach) at Ottawa, Canada (Hadwen).

REMARKS.

A lateral view of the head is usually more readily secured in mounted specimens of *U. criniformis* and *U. stenocephala* and in my experience is more useful for diagnostic purposes than a dorsal view. Dorsal views give very variable pictures because of differences in the tilting of the head in different specimens, and comparisons of specimens and of drawings are more difficult than in the case of lateral views. It may be noted as of interest that Railliet's drawing of the dorsal view of the head of *Uncinaria stenocephala* (see Railliet, 1893*a*, fig. 331) corresponds very well with the appearance frequently shown by specimens of *U. polaris* (U. S. N. M., 3250) which happen to be less tilted than in the view pictured by Looss (1911, fig. 108).

Looss (1911, p. 213) states that the boundary line between the thicker ventral portion and the thinner dorsal portion of the mouth-capsule wall of *U. polaris* is nearly straight and he shows it but very slightly curved in his drawing (Looss, 1911, fig. 107). In full lateral views of the mouth-capsule of *U. polaris* (= *U. stenocephala*) from the fox (fig. 1, *x*), and of *U. stenocephala* from the dog (fig. 5, *x*) I have found it more curved than Looss has described and figured it.

In Looss's drawing (Looss, 1911, fig. 116) of the bursa of *U. criniformis* the postero-lateral ray is shown as thicker than the medio-lateral ray. In all the specimens I have examined the reverse is true (fig. 10).

The lateral membranous ala of the spicule is more strongly developed in *U. criniformis* than in *U. stenocephala* and extends around the tip. In *U. stenocephala* it narrows down and disappears before the tip of the spicule is reached.

In the specimens that I have examined, the cuticle of *Uncinaria stenocephala* is usually considerably thicker than that of *U. criniformis*. For example, on the tail of the female of the latter species it has not been found to exceed 5 μ in thickness, but commonly measures 7 or 8 μ in thickness in the same region of the female of *U. stenocephala*.

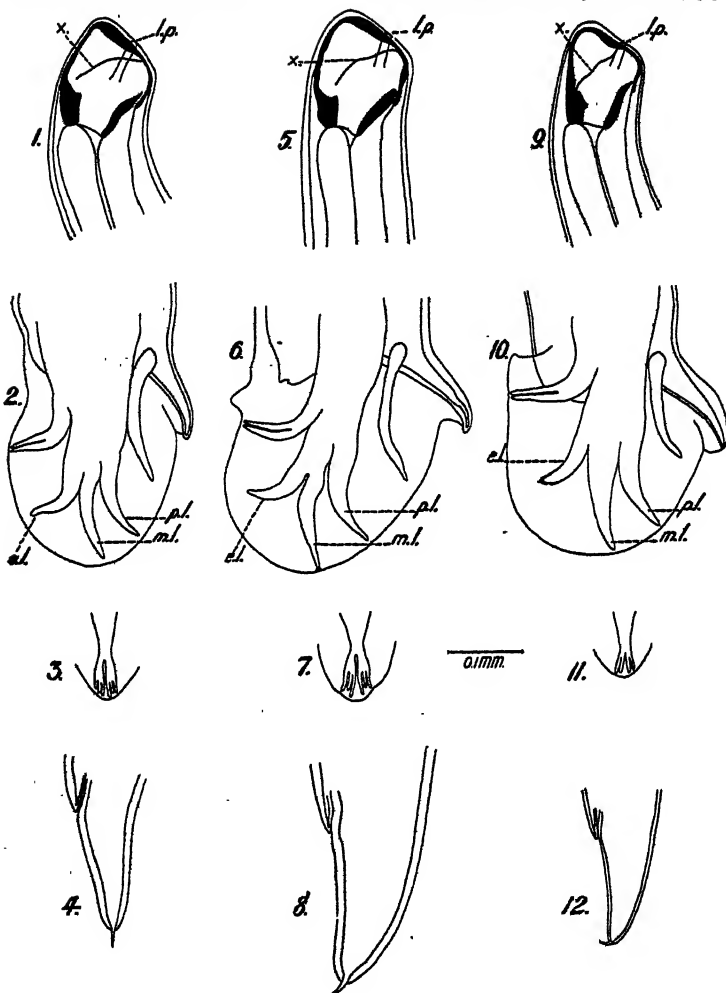
In both *U. criniformis* and *U. stenocephala* the excretory pore, nerve ring and cervical papillae are located in the same general region of the neck, but vary more or less in their relative positions in different specimens in both species. I have failed to find constant differences in these characters between the two species.

The caudal pores on the tail of the female are about 45 μ from the tip (excluding the caudal bristle) in *U. stenocephala*, and in the only case measured in *U. criniformis* were 30 μ from the tip.

It is of interest to note that as yet *Uncinaria stenocephala* is not known to have become established as a parasite of the dog in the United States except in Alaska. On the other hand it is a common parasite of the foxes on fur farms in the Northern United States, including Alaska and in Canada, and is one of the most serious pests with which fox raisers have to contend. Thus far, the only cases of this parasite in dogs in North America of which I have knowledge are those seen by Hadwen in Alaska. The same observer has found *U. stenocephala* in a hog at Ottawa, Canada (Ransom, 1921, p. 190).

ADDENDUM.

While the present paper was in the hands of the printer two papers, one by Fülleborn (1924) and one by Cameron (1924) have appeared which bear upon the question of the identity of *Uncinaria polaris* and *U. stenocephala*. Both authors are of the opinion that the two forms belong to the same species, an opinion which accords with my own findings based upon a study of the material from which Looss obtained his specimens of *U. polaris*. Cameron appears to be doubtful whether the form described by Goeze as *Ascaris criniformis* should be considered an identifiable species. In view of the fact, however, that a well-defined species of *Uncinaria* occurs in the European badger which seems in all probability to be the same as that described by Goeze there appears to be no good reason



Uncinaria
pulex
(= *stenocephala*).
Fox.

Uncinaria
stenocephala
Dog.

Uncinaria
cliniiformis.
Badger.

HOOKWORMS OF THE DOG, FOX, AND BADGER

FOR EXPLANATION OF PLATE SEE PAGE 5

why it should not be accepted as belonging to Goeze's species until it can be shown to be different.

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EXPLANATION OF PLATE.

All figures drawn with camera lucida at same magnification as indicated by scale on plate.

ABBREVIATIONS.

- e. l.*, externo-lateral ray.
- l. p.*, lateral cephalic papilla.
- m. l.*, medio-lateral ray.
- p. l.*, postero-lateral ray.
- x.*, boundary line between thicker ventral portion and thinner dorsal portion of lateral wall of oral capsule.

FIGS. 1-4.—*Uncinaria polaris* (= *stenocephala*).

- FIG. 1.—Head from left side. U.S.N.M. Helm. Coll. 3250.
- 2.—Male bursa from left side. U.S.N.M. Helm. Coll. 3250.
- 3.—Dorsal ray of male bursa. U.S.N.M. Helm. Coll. 3250.
- 4.—Tail of female from left side. U.S.N.M. Helm. Coll. 3250.

FIGS. 5-8.—*Uncinaria stenocephala*.

- FIG. 5.—Head from left side. U.S.N.M. Helm. Coll. 19,326.
- 6.—Male bursa from left side. U.S.N.M. Helm. Coll. 19,326.
- 7.—Dorsal ray of male bursa. U.S.N.M. Helm. Coll. 19,330.
- 8.—Tail of female from left side. U.S.N.M. Helm. Coll. 19,330.

FIGS. 9-12.—*Uncinaria crinitiformis*.

- FIG. 9.—Head from left side. U.S.N.M. Helm. Coll. 3392.
- 10.—Male bursa from left side. U.S.N.M. Helm. Coll. 24,788.
- 11.—Dorsal ray of male bursa. U.S.N.M. Helm. Coll. 19,332.
- 12.—Tail of female from left side. U.S.N.M. Helm. Coll. 3392.

A NEW GENUS AND SPECIES OF TWO-WINGED FLIES
OF THE FAMILY CHLOROPIDAE INJURING MANIHOT
IN BRAZIL.

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Associate Curator, Division of Insects, United States National Museum.

The species herein described was received by the Bureau of Entomology for identification, from Prof. Carlos Moreira of the Instituto Biologico de Defesa Agricola, Rio Janeiro, who states that it is a bad miner of Cassava, *Manihot utilisima* in Brazil.

TELEOCOMA, new genus.

Head broad and flat; antennae short, third joint almost circular in outline, with slender bare arista; face transversely concave, epistoma not prominent; palpi normal; proboscis short, the terminal joint folding back but short; front wide; eye shorter vertically than longitudinally. Thorax not grooved dorsally, decidedly longer than wide, the scutellum flat above, subtriangular but rounded apically, with only microscopic denticles from which the bristles arise. Wing with normal venation, the costa extending to fourth vein. Hind tibia without any distinct spine at tip. Bristles rather strongly developed, especially two notopleurals, two humerals, one supraalar, one intraalar, one posterior dorsocentral (the last three close to the scutellum), one apical pair on scutellum. There are also two vertical pairs, one postvertical, and a small pair of vibrissae.

Genotype.—*Teleocoma crassipes*, new species.

TELEOCOMA CRASSIPES, new species.

Male.—Front black above, yellow beyond middle, at vertex much wider than one eye; ocellar triangle small, not reaching half way to antennae; frontal bristles minute; antennae wholly reddish yellow; face and bucca (below eye) white, the latter darker along lower and posterior edge, and about one-third the eye-height; palpi yellow.

Thorax black, the sides polished, the dorsum with a tinge of bronze, covered with even, short, pale yellow hairs arising from evi-

dent punctures. The width at humeri is to the length to scutellar suture as 23 to 29, by micrometer. Scutellum on its flat upper surface with pale hairs like the mesonotum, but more strongly punctured; at the tip are two parallel bristles and on each side two or three small hairs, all arising from very minute, microscopic denticles. Halteres white, stem yellow.

Abdomen narrow and tapering, the apex curved downward; the first and second segments pale yellow above except at the sides, the following three wholly black, the sides of all but the first with long, silky, whitish hairs, the second also bears black spiny hairs at the side. Venter membranous, whitish.

Legs mostly yellowish, but the hind femora and tibiae and the apices of all the tarsi are black or blackish, and the front femora and tibiae are slightly infuscated. The front femora are thickened, and have long pale hair below; the front tibiae have a heavy fringe of brownish hair on the outer hind side, which extends on the first and second tarsal joints. The hind femora are large, greatly thickened and curved; their tibiae are rather stout and have on the outer front side numerous long curled pale hairs extending forward, overlapping the femora in the flexed position.

Wing hyaline, normal, fourth vein reaching the margin barely behind the apex.

Female.—Head and thorax as in male; the pale spot at base of abdomen is smaller though distinct, leaving a wider black margin at sides. The abdomen and legs do not have the long yellow hair characteristic of the male; the front femora are yellow and hardly thickened at all. The hind femora, however, are almost as large as in the male, the hind tibiae as in the male; the hind tarsi black except the contrasting yellow basal joint.

Length of male 4 mm., of female 3.2 mm.

Described from one male and three females received from Professor Moreira as stated above.

Type.—Male, Cat. No. 26487, U.S.N.M.

Two paratypes are returned to the sender for preservation in a Brazilian museum.

THE FOSSILS OF THE LOWER SAN PEDRO FAUNA OF THE NOB HILL CUT, SAN PEDRO, CALIFORNIA

By T. S. OLDROYD,
Of Stanford University, California

INTRODUCTION

The cut through Nob Hill at San Pedro exposed a large deposit of the Lower San Pedro series of the Pleistocene. In July, 1918, the steam shovel had worked its way down to the bed, uncovering no shells of the upper series in the cut, except a few at the south end. This was especially good, as heretofore in most places where the lower series was exposed, the upper series had cropped out above it; as at Deadman's Island. This made collecting in the latter place from the lower series rather uncertain, as the upper would cave down in quantities from the action of the wind and rain, settle on the edge of the lower, and on becoming packed, looked as if it belonged there. This immense deposit, extending the whole length and breadth of the cut and an unknown distance further, was nearly 6 feet thick, and in the center of the cut, where it had not been graded down, was 20 feet below the surface and dipped to the northeast. The first layer commencing at the bottom was about 15 inches thick and sparsely filled with shells, mostly bivalves. Next above there was a bed of bivalves about 4 inches thick, composed mostly of *Macoma nasuta* Conrad, and *Macoma secta* Conrad; these were very plentiful and in a natural condition as they had lived, and had not been disturbed, but were covered up by about 17 inches of sand in which there were no shells. The next layer was about 4 inches thick, composed of *Ostrea lurida* Carpenter, and *Aletes squamigerus* Carpenter. While the life of the bed of *Macoma* was a short one, as none of them had reached a maximum growth, the bed of oysters had apparently lasted for a much longer period of time. This bed, like that of the *Macomas*, was not disturbed but covered up in a natural position. The next layer is a conglomerate mass two feet thick, very compact but not hardened; washed up by some storm, it contains a great many species from deep water. The next and last layer was about 17 inches thick,

composed of loose washed sand and small drift shells washed high on the beach. Judging from the species that lived here, in the two natural beds mentioned, this place must have been an estuary or flat in a protected place, though exposed to unusually severe storms; a place such as existed at Tims Point 30 or 40 years ago.

Of the 242 species of shells found in the Nob Hill cut, 115 are found in Puget Sound and north of there. In our four seasons' dredging and shore collecting near Friday Harbor, Wash., we have found a great many of them living. Our dredging has been mostly in the San Juan Channel, where I think more of the Nob Hill fossil species are found living, than anywhere else. The water in the channel is very cold, because the current comes in from the ocean through the Strait of Juan de Fuca. The water in Departure Bay about 75 miles north of there will average 10 degrees warmer the year round, according to Doctor Fraser who is in charge of the Dominion Marine Biological Station. After the Lower San Pedro time and the climate of California began to get warmer, many of the mollusks went north or sought the cold waters of a greater depth. There seems to be a streak of the northern mollusks in about 100 fathoms all along the coast as far south as Lower California. It is a fact that there are quite a few southern species in the lower San Pedro, and also some northern species in the upper; they all lived in the lower San Pedro during that epoch. They did not all go north, some accustomed themselves to the change in temperature, and are found living now near San Pedro. Some withstood the change for a long time and are found in the upper series, but finally died out, and are not now found living here except in very deep water.

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LIST OF SHELLS FROM THE LOWER SAN PEDRO PLEISTOCENE
SERIES FROM THE NOB HILL CUT, SAN PEDRO, CALIFORNIA.

Family NUCULIDAE.

Genus NUCULA Lamarck, 1799.

Subgenus ACILA H. and A. Adams, 1858.

NUCULA CASTRENSIS Hinds, 1843, three small valves.
Living, Bering Sea-San Diego.

Family LEDIDAE.

Genus LEDA Schumacher, 1817.

LEDA TAPHRIA Dall, 1897, six valves.

Living, Bodega Bay, California—Lower California.

LEDA HAMATA Carpenter, 1864, one small valve.

Living, Puget Sound—Panama Bay.

LEDA CELLULITA Dall, 1896, one specimen.

Living, Puget Sound.

Family ARCIDAE.

Genus GLYCYMERIS Da Costa, 1778.

GLYCYMERIS SEPTENTRIONALIS Middendorff, 1849.

Living, Aleutian Islands, Alaska—Puget Sound.

? Family PHILOBRYIDAE.

Genus PHILOBRYA Carpenter, 1872.

PHILOBRYA SETOSA Carpenter, 1864, one valve.

Living, Forrester Island, Alaska—Gulf of California.

Family OSTREIDAE.

Genus OSTREA Linnaeus, 1758.

OSTREA LURIDA Carpenter, 1864, very plentiful.

Living, Sitka, Alaska—Cape San Lucas.

Family PECTINIDAE.

Genus PECTEN Muller, 1776.

Subgenus CHLAMYS Bolten, 1798.

PECTEN HASTATUS Sowerby, 1843, four small valves.

Living, Monterey—Newport, California, deep water.

PECTEN JORDANI Arnold, 1903, three valves.

Living, Puget Sound.

Section PATINOPECTEN Dall, 1898.

PECTEN CAURINUS Gould, 1850, two broken valves.

Living, Wrangell, Alaska—Oregon and Puget Sound.

Section LEPTOPECTEN Verrill, 1897.

PECTEN LATIAURITUS Conrad, 1837, not rare.

Living, Monterey, California—Lower California.

Family MYTILIDAE.

Genus MYTILUS Linnaeus, 1758.

MYTILUS CALIFORNIANUS Conrad, 1837, part of one valve.

Living, Aleutian Islands—Lower California.

Genus SEPTIFER Recluz, 1848.**SEPTIFER BIFURCATUS** (Conrad) Reeve, 1837, ten valves.

Living, Crescent City, California—Gulf of California.

Genus MODIOLUS Lamarck, 1799.**MODIOLUS MODIOLUS** Linnaeus, 1858, part of one valve.

Living on the west coast from the Arctic—San Pedro, California.

MODIOLUS CAPAX Conrad, 1837, one valve.

Living, Santa Barbara, California—Peru.

Genus BOTULA Mörch, 1853.Subgenus **ADULA** H. and A. Adams, 1857.**BOTULA FALCATA** Gould, 1851, three specimens.

Living, Coos Bay, Oregon—San Diego, California.

Genus CRENELLA Brown, 1827.**CRENELLA DECUSSATA** Montagu, 1808, about 100 valves.

Living, Bering Sea—San Pedro, California.

Family THRACIIDAE.**Genus CYATHODONTA Conrad, 1848.****CYATHODONTA PEDROANA** Dall, 1916, one valve and several pieces.

Living, San Pedro and Catalina Island, California.

Family LYONSIIDAE.**Genus LYONSIA Turton, 1822.****LYONSIA CALIFORNICA** Conrad, 1837, plentiful.

Living, Puget Sound—Lower California.

Genus MYTILIMERIA Conrad, 1837.**MYTILIMERIA NUTTALLII** Conrad, 1837, one valve.

Living, Vancouver Island—San Diego, California.

Family VERTICORDIIDAE.**Genus VERTICORDIA Wood, 1844.****VERTICORDIA ORNATA** Orbigny, 1846, three valves.

Living, Catalina Island, California—Panama.

Family CARDITIDAE.**Genus CARDITA (Bruguière) Lamarck, 1799.**Section **CARDITAMERA** Conrad, 1838.**CARDITA SUBQUADRATA** Carpenter, 1865, about thirty valves.

Living, Queen Charlotte Islands—Lower California.

Genus **VENERICARDIA** Lamarck, 1801.**VENERICARDIA VENTRICOSA** Gould, 1850, thirteen valves.

Living, Alaska—Lower California.

Subgenus **MIODONTISCUS** Dall, 1903.**VENERICARDIA PROLONGATA** Carpenter, 1864, four valves.

Living, Alaska—San Diego, California.

Family **THYASIRIDAE**.Genus **THYASIRA** (Leach in) Lamarck, 1818.**THYASIRA GOULDII** Philippi, 1845, one valve.

Living, Alaska—Lower California.

Family **DIPLODONTIDAE**.Genus **DIPLODONTA** Bronn, 1831.**DIPLODONTA ORBELLA** Gould, 1852, twelve valves.

Living, Bering Sea—Gulf of California.

Family **LUCINIDAE**.Genus **PHACOIDES** Gray, 1847.Subgenus **LUCINISCA** Dall, 1901.**PHACOIDES NUTTALLII** Conrad, 1837, plentiful.

Living, Santa Barbara, California—Mexico.

Subgenus **LUCINOMA** Dall, 1901.**PHACOIDES ANNULATUS**, Reeve, 1850, var. *densiliratus* Dall, 1919.

Living, Sitka, Alaska—Esteros Bay, California.

Subgenus **CALLUCINA** Dall, 1901.Section **EPILUCINA** Dall, 1901.**PHACOIDES CALIFORNICUS** Conrad, 1837, plentiful.

Living, Crescent City, California—Lower California.

Subgenus **PARVILUCINA** Dall, 1901.**PHACOIDES TENUISCULPTUS** Carpenter, 1864, six valves.

Living, Bering Sea—Coronado Islands.

PHACOIDES APPROXIMATUS Dall, 1901, about 100 valves.

Living, Monterey, California—Panama.

Family **LEPTONIDAE**.Genus **KELLIA** Turton, 1822**KELLIA LAPEROUSII** Deshayes, 1839, six valves.

Living, Bering Sea—San Diego, California.

Family CARDIIDAE.

Genus **CARDIUM** Linnaeus, 1757.

Subgenus **TRACHYCARDIUM** Mörch, 1853.

CARDIUM QUADRAGENARIUM Conrad, 1837, valve, not reported before from the Lower San Pedro.

Living, Santa Barbara, California-Todos Santos Bay, Lower California.

Subgenus **CERASTODERMA** Mörch, 1853.

CARDIUM CORBIS Martyn, 1784, quite plentiful, but all shells thin, fragile, broken.

Living, Bering Sea-San Francisco, California.

Genus **PROTOCOLDIA** Beyrich, 1845.

PROTOCOLDIA GENTIFILOSA Carpenter, 1864, three valves.

Living, Departure Bay, British Columbia-Lower California.

Genus **TIVELA** Link, 1807.

Subgenus **PACHYDESMA** Conrad, 1854.

TIVELA STULTORUM Mawe, 1923, one valve.

Living, Santa Cruz-Lower California.

Genus **TRANSENNELLA** Dall, 1883.

TRANSENNELLA TANTILLA Gould, 1852, very plentiful.

Living, Sitka Harbor, Alaska-Lower California.

Genus **SAXIDOMUS** Conrad, 1837.

SAXIDOMUS NUTTALLII Conrad, 1837, not rare.

Living, Humboldt Bay to San Diego, California.

Genus **PAPHIA** Bolten, 1798.

Subgenus **PROTOTHACA** Dall, 1902.

Section **PROTOTHACA** Dall, 1902, s. s.

PAPHIA STAMINEA Conrad, 1837, plentiful.

Living, Bering Sea-Lower California.

Family PETRICOLIDAE.

Genus **PETRICOLA** Lamarck, 1801.

PETRICOLA CARDITOIDES Conrad, 1837, plentiful.

Living, Vancouver Island-San Pedro, California.

Family TELLINIDAE.

Subgenus **MORRELLA** Fischer, 1887.

TELLINA SALMONEA Carpenter, 1864, not plentiful.

Living, Aleutian Islands-San Pedro, California.

Subgenus *ANGULUS* Megerle, 1811.

TELLINA CARPENTERI Dall, 1900, not plentiful.
Living, Bering Sea-Gulf of California.

Subgenus *UDARDIA* Monterosato, 1884.

TELLINA BUTTONI Dall, 1900, eight valves.
Living, Alaska-Gulf of California.

Subgenus *PERONIDIA* Dall, 1900.

TELLINA BODEGENSIS Hinds, 1844, not plentiful.
Living, Queen Charlotte Islands, British Columbia-Gulf of California

Genus *METIS* H. and A. Adams, 1856.

METIS ALTA Conrad, 1837, one valve.
Living, Santa Barbara-San Diego, California.

Genus *MACOMA* Leach, 1819.

MACOMA NASUTA Conrad, 1837, very plentiful.
Living, Kodiak Island, Alaska-Lower California.
MACOMA INQUINATA Deshayes, 1854, four valves.
Living, Bering Sea-Monterey, California.

Section *REXITHAERUS* Conrad, 1869.

MACOMA INDENTATA Carpenter, 1864, five valves.
Living, San Pedro-San Diego, California.

Family *SEMELIDAE*.Genus *SEMELE* Schumacher, 1817.

SEMELE RUBROPICTA Dall, 1871, one valve.
Living, Bering Sea-Lower California.
SEMELE INCONGRUA Carpenter, 1864, fifteen valves.
Living, Monterey-Coronado Islands.

Genus *CUMINGIA* Sowerby, 1833.

CUMINGIA LAMELLOSA Sowerby, 1833, plentiful.
Living, Crescent City, California-Peru.

Family *DONACIDAE*.Genus *DONAX* Linnaeus, 1758.

DONAX CALIFORNICA Conrad, 1837, two valves.
Living, Santa Barbara-Lower California.

Family *PSAMMOBIIDAE*.Genus *PSAMMOBIA* Lamarck, 1818.Subgenus *GOBRAEUS* Leach, 1852.

PSAMMOBIA CALIFORNICA Conrad, 1848, not plentiful.
Living, Aleutian Islands-San Diego, California.

Genus *SANGUINOLARIA* Lamarck, 1799.Section *NUTTALLIA* Dall, 1897.*SANGUINOLARIA NUTTALLII* Conrad, 1837, not rare.

Living, San Pedro, California-Magdalena Bay, Lower California.

Family *SOLENIIDAE*.Genus *SOLEN* (Linnaeus) Scopoli, 1777.*SOLEN SICARIUS* Gould, 1850, four valves.

Living, Vancouver Island-Lower California.

Family *MACTRIDAE*.Genus *SPISULA* Gray, 1838.Subgenus *SYMMORPHOMACTRA* Dall, 1894.*SPISULA PLANULATA* Conrad, 1837, twelve valves.

Living, Monterey-Cape San Lucas, Lower California.

Genus *SCHIZOTHAERUS* Conrad, 1853.*SCHIZOTHAERUS NUTTALLII* Conrad, 1837, rare.

Living, Alaska-San Diego, California.

Family *MYACIDAE*.Genus *CRYPTOMYA* Conrad, 1849.*CRYPTOMYA CALIFORNICA* Conrad, 1837, plentiful.

Living, Alaska-Mexico.

Family *SAXICAVIDAE*.Genus *SAXICAVA* Fleuriau, 1802.*SAXICAVA ARCTICA* Linnaeus, 1767, two valves.

Living, Alaska-Panama. Also Atlantic.

Family *PHOLADIDAE*.Genus *PHOLADIDEA* Turton, 1848.*PHOLADIDEA PENITA* Conrad, 1837, plentiful.

Living, Alaska-San Diego, California.

Family *TEREDIDAE*.*TEREDO* TUBES, species indeterminate.Family *DENTALIIDAE*.Genus *DENTALIUM* Linnaeus, 1758.*DENTALIUM NEOHEXAGONUM* Sharp and Pilsbry, 1897, not rare.

Living, Monterey, California-Central America.

DENTALIUM PRETIOSUM Sowerby, 1860, not rare.

Living, Forrester Island, Alaska-San Diego, Calif.

Genus *CADULUS* Philippi, 1844.*CADULUS HEPBURNI* Dall, 1897, not rare.

Living, Victoria, British Columbia, to Monterey, California.

Family *ACTEONIDAE*.Genus *ACTEON* Montfort, 1810.Subgenus *RICTAXIS* Dall, 1871.*ACTEON PUNCTOCOELATUS* Carpenter, 1864, one specimen.

Living, Vancouver Island, British Columbia—Magdalena Bay, Lower California.

Family *ACTEOCINIDAE*.Genus *ACTEOCINA* Gray, 1847.*ACTEOCINA PEDROENSIS*, new species, plentiful.*ACTEOCINA EXIMIA* Baird, 1863, four specimens.

Living, Kodiak Island, Alaska—Puget Sound.

ACTEOCINA INFREQUENS C. B. Adams, 1852, not rare.

Living, Santa Monica, California—Panama.

ACTEOCINA CEREALIS Gould, 1853, not rare.

Living, Santa Barbara—San Diego, California.

ACTEOCINA TUMIDA T. S. Oldroyd, 1922.

Not found living.

Genus *RETUSA* Brown, 1837.Section *COLEOPHYSIS* Fischer, 1883.*RETUSA HARPA* Dall, 1871, not rare.

Living, Queen Charlotte Islands, British Columbia—San Diego, California.

Genus *VOLVULELLA* Newton, 1891.*VOLVULELLA COOPERI* Dall, 1819, not rare.

Living, Catalina Island—Scammon Lagoon, Lower California.

Family *SCAPHANDRIDAE*.Genus *CYLICHNELLA* Gabb, 1872.*CYLICHNELLA ALBA* Brown, 1827, two specimens.

Living, Arctic Ocean—San Diego, California.

Family *AKERIDAE*.Genus *HAMINOEA* Turton, 1830.*HAMINOEA DALLI* Bartsch, new species, plentiful.

Living, Santa Barbara, California—Mexico.

HAMINOEA VESICULA Gould, 1855, not rare.

Living, Vancouver Island, British Columbia—Gulf of California.

Family *SIPHONARIIDAE*.Genus *WILLIAMIA* Monterosato, 1884.*WILLIAMIA VERNALIS* Dall, 1870, three specimens.

Living, Crescent City, California—San Diego.

Family CONIDAE.

Genus CONUS Linnaeus, 1758.

CONUS CALIFORNICUS Hinds, 1844, plentiful.

Living, Farallones Islands, California-Ballenas Lagoon, Lower California.

CONUS CALIFORNICUS FOSSILIS T. S. Oldroyd, 1921, not rare.

Not found living.

Family TURRITIDAE.

Genus MONILIOPSIS Conrad, 1865.

MONILIOPSIS INCISA OPHIODERMA Dall, 1908, not rare.

Living, Bolinas Bay, California-Ballenas Lagoon, Lower California.

Genus ANTIPLANES Dall, 1902.

ANTIPLANES PERVERSA Gabb, 1865.

Living, Forrester Island, Alaska-San Diego, California.

Genus BORSONELLA Dall, 1903.

BORSONELLA BARTSCHI Arnold, 1903, six specimens.

Living, San Pedro-San Diego.

Genus PHILBERTIA Monterosato, 1884.

PHILBERTIA CANFIELDI Dall, 1871, five specimens.

Living, Crescent City, California-Laguna Beach.

Genus GLYPHOSTOMA Gabb, 1873.

GLYPHOSTOMA CONRADIANA Gabb, 1869, one specimen.

Living, San Pedro, California.

Genus MANGILIA Risso, 1826.

MANGILIA ANGULATA Carpenter, 1865, plentiful.

Living, Puget Sound-Gulf of California.

MANGILIA (KURTZIELLA) ARTEAGA Dall and Bartsch, 1910, two specimens.

Living, Puget Sound.

Subgenus CLATHROMANGILIA Monterosato, 1884.

CLATHROMANGILIA RHYSSA Dall, 1919, one specimen.

Living, San Diego, California.

Genus CYTHARELLA Monterosato, 1875.

Section CYTHARELLA s.s.

CYTHARELLA BRANNERI Arnold, 1903, numerous.

Living, Panama.

Genus DAPHNELLA Hinds, 1844.

DAPHNELLA FUSCOLIGATA Dall, 1871, one specimen.

Living, Monterey-San Diego, California.

Family CANCELLARIIDAE.

Genus ADMETE Kroyer, 1842.

ADMETE RHYSSA Dall, 1919, one specimen.

Living, Santa Rosa Island, California—South Coronado Island.

Family OLIVELLIDAE.

Genus OLIVELLA Swainson, 1840.

OLIVELLA BIPPLICATA Sowerby, 1825, typical, not rare.

Living, Monterey—Pismo Beach, California.

OLIVELLA BOETICA Carpenter, 1864, typical, plentiful.

Living, Vancouver Island and Puget Sound.

OLIVELLA PEDROANA Conrad, 1855, twelve specimens.

Living, Puget Sound—Cape San Lucas, Lower California.

Family MARGINELLIDAE.

Genus MARGINELLA Lamarck, 1799.

MARGINELLA JEWETTH Carpenter, 1857, new variety NANELLA; plentiful.

Living, Monterey, California—Lower California.

MARGINELLA SUBTRIGONA Carpenter, 1865; nine specimens.

Living, Monterey—San Diego, California.

Genus CYPRAEOLINA Cerulli-Irelli, 1911.

CYPRAEOLINA MARGARITULA Carpenter, 1865; not rare.

Living, Cape San Lucas—Mazatlan, Mexico.

Family MITRIDAE.

Genus MITROMORPHA A. Adams, 1865.

MITROMORPHA FILOSA Carpenter, 1865; one specimen.

Living, Monterey, California—Gulf of California.

Family FASCIOLARIIDAE.

Genus FUSINUS Rafinesque, 1815.

Section HEILPRINIA Grabau, 1904.

FUSINUS MONKSAE Dall, 1915, ten specimens.

Living, British Columbia—Lower California.

Family ALECTRIONIDAE.

Genus ALECTRION Montfort, 1810.

Section SCHIZOPYGA Conrad, 1850.

ALECTRION FOSSATUS Gould, 1849; twelve specimens.

Living, Vancouver Island—Cerro Island, Lower California.

ALECTRION MENDICUS Gould, 1849; plentiful.

Living, Kodiak Island, Alaska—Magdalena Bay, Lower California.

ALECTRION COOPERI Forbes, 1850; plentiful.

Living, Puget Sound—San Diego, California.

ALECTRION COOPERI, var. **INDISPUTABILIS** L. S. Oldroyd, 1921; plentiful.

Living, Puget Sound—San Diego, California.

ALECTRION COOPERI, var. **WOODWARDI** Forbes, 1850; not rare.

Living, Puget Sound—San Pedro, California.

ALECTRION PERPINGUIS Hinds, 1844; plentiful.

Living, Vancouver Island, British Columbia—Cerro Island, Lower California.

Family COLUMBELLIDAE.

Genus **COLUMBELLA** Lamarck, 1799.

Subgenus **ALIA** H. and A. Adams, 1853.

COLUMBELLA TUBEROSA Carpenter, 1865; new variety **MAJOR**; plentiful.

Living, Forrester Island, Alaska—Gulf of California.

COLUMBELLA CALIFORNIANA Gaskoin, 1852; plentiful.

Living, Forrester Island, Alaska—Salina Cruz, Mexico.

COLUMBELLA CARINATA Hinds, 1844; plentiful.

Living, San Francisco Bay—Cape San Lucas, Lower California.

Genus **ANACHIS** Adams, 1853.

ANACHIS PENICILLATA Carpenter, 1865; ten specimens.

Living, San Pedro, California—Gulf of California.

Genus **NITIDELLA** Swainson, 1840.

NITIDELLA GOULDII Carpenter, 1857; twenty specimens.

Living, Kodiak Island, Alaska—San Diego, California.

Genus **AESOPUS** Gould, 1864.

AESOPUS IDAE Bartsch, 1918, one specimen, the type.

Not reported living.

Genus **AMPHISSA** H. and A. Adams, 1853.

AMPHISSA VERSICOLOR LINEATA Stearns, 1872; not rare.

Living, Monterey, California.

Family MURICIDAE.

Genus **TRITONALIA** Fleming, 1828.

TRITONALIA LURIDA Middendorff, 1849; two specimens.

Living, Forrester Island, Alaska—San Diego, California.

TRITONALIA INTERFOSSA Carpenter, 1864; three specimens.

Living, Alaska—San Diego, California.

TRITONALIA INTERFOSSA, var. **BETA** Carpenter, 1864; plentiful.

Living, Monterey, California.

TRITONALIA KEEPI Arnold, 1903; ten specimens.

Not reported living.

Genus **TROPHON** Montfort, 1810.Subgenus **NEPTUNEA** (Bolten, part, 1798) Dall, 1902**TROPHON MULTICOSTATA** Eschscholtz, 1829; not rare.

Living, Bering Sea—San Diego, California.

TROPHON STUARTI E. A. Smith, 1880; three specimens.

Living, Alaska—San Diego, California.

Family **EPITONIIDAE**.Genus **EPITONIUM** Bolten, 1798.Subgenus **OPALIA** H. Adams, 1858.**EPITONIUM WROBLEWSKII** Mörch, 1876; not rare.

Living, Forrester Island, Alaska—San Diego, California.

Subgenus **NITIDOSCALA** De Boury, 1909.**EPITONIUM INDIANORUM** Carpenter, 1856; not rare.

Living, Forrester Island, Alaska—Todos Santos Bay, Lower California.

EPITONIUM TINCTUM Carpenter, 1865; not rare.

Living, Monterey, California—Gulf of California.

EPITONIUM SUBCORONATUM Carpenter, 1866; eighteen specimens.

Living, Vancouver Island, British Columbia—San Diego, California.

EPITONIUM CREBRICOSTATUM Carpenter, 1866; two specimens.

Living, Vancouver Island—Gulf of California.

EPITONIUM CAAMANOI Dall and Bartsch, 1910; four specimens.

Living, Vancouver Island—San Pedro, California.

EPITONIUM CONTINUATUM, new species; two specimens.

Not known living.

Section **CRISPOSCALA** De Boury, 1909.**EPITONIUM ACROSTEPHANUM** Dall, 1908; one specimen.

Living, Monterey, California—Coronado Islands.

Family **MELANELLIDAE**.Genus **MELANELLA** Bowdich, 1822.Section **MELANELLA** s. s.**MELANELLA THERSITES** Carpenter, 1864; five specimens.

Living, Monterey, California—San Geronimo Island, Lower California.

MELANELLA PREFALCATA Bartsch, 1917; one specimen.

Not reported living.

MELANELLA FOSSILIS Bartsch, 1918; one specimen.

Not reported living.

Family **PYRAMIDELLIDAE**.Genus **TURBONILLA** Risso, 1826.**TURBONILLA PECORA**, new species. Five specimens.

Not known living.

Subgenus *STRIOTURBONILLA* Sacco, 1892.

TURBONILLA ASSER Dall and Bartsch, 1909; four specimens.

Living, Redondo Beach to San Diego, California.

TURBONILLA ARESTA Dall and Bartsch, 1909, one specimen.

Living, Santa Rosa Island to San Diego, California.

Subgenus *CHEMNITZIA* Orbigny, 1839.

TURBONILLA AEPYNOTA Dall and Bartsch, 1909; two specimens.

Living, San Pedro to San Martin Island, Lower California.

Subgenus *PYRGOLAMPROS* Sacco, 1892.

TURBONILLA COLLISELLAE, new species; numerous.

Not known living.

TURBONILLA IDAE, new species; abundant.

Not known living.

TURBONILLA RINELLA Dall and Bartsch, 1910; one specimen.

Living, Barkley Sound, Vancouver Island.

Subgenus *PYRGISCUS* Philippi, 1839.

TURBONILLA TENUICULA Gould, 1853; nine specimens.

Living, Monterey to Point Abreojos, Lower California.

TURBONILLA HIMERTA, new species; five specimens.

Not known living.

Subgenus *MORMULA* A. Adams, 1854.

TURBONILLA EPIPHANIA, new species; thirty specimens.

Not known living.

Subgenus *BARTSCHELLA* Iredale, 1917.

TURBONILLA LAMINATA Carpenter, 1856; numerous.

Living, San Pedro, California, to Point Abreojos, Lower California.

Genus *ODOSTOMIA* Fleming, 1817.Subgenus *CHRYSTALLIDA* Carpenter, 1856.

ODOSTOMIA GOMPHINA, new species; two specimens.

Not known living.

ODOSTOMIA SCELERA, new species; nine specimens.

Not known living.

Subgenus *IVARA* Dall and Bartsch, 1903.

ODOSTOMIA AMAVA, new species; one specimen.

Not known living.

Subgenus *EVALEA* A. Adams, 1860.

ODOSTOMIA TERSA, new species; six specimens.

Not known living.

ODOSTOMIA ITHEA, new species; two specimens.

Not known living.

ODOSTOMIA MANCA, new species; numerous.

Not known living.

ODOSTOMIA CIVITELLA, new species; sixteen specimens.

Not known living.

ODOSTOMIA FITELLA, new species.

Not known living.

Subgenus **AMAURA** Moller, 1842.

ODOSTOMIA MENZOLA, new species; sixteen specimens.

Not known living.

ODOSTOMIA TROCHILA, new species; two specimens.

Not known living.

ODOSTOMIA SANESIA, new species; two specimens.

Not known living.

ODOSTOMIA TIMESSA, new species; three specimens.

Not known living.

Family CYMATHIDAE.

Genus **ARGOBUCCINUM** Mörch, 1852.

Subgenus **FUSITRITON** Cossmann, 1903.

ARGOBUCCINUM OREGONENSIS Redfield, 1843; three specimens.

Living, Bering Sea—San Diego, California. Also Japan.

Family CERITHIOPSIDAE.

Genus **CERITHIOPSIS** Forbes and Hanley, 1849.

CERITHIOPSIS FOSSILIS Bartsch, 1911; one specimen.

Not known living.

CERITHIOPSIS FATUA Bartsch, 1911; three specimens.

Living, Santa Barbara and Coronado Islands.

Section **CERITHIOPSIDA** Bartsch, 1911.

CERITHIOPSIS DIEGENSIS Bartsch, 1911; two specimens.

Living, San Clemente and Coronado Islands, and San Diego.

Section **CERITHIOPSINA** Bartsch, 1911.

CERITHIOPSIS NECROPOLITANA Bartsch, 1911; three specimens.

Not known living.

Genus **SEILA** A. Adams, 1861.

SEILA MONTEREYENSIS Bartsch, 1907; seven specimens.

Genus **METAXIA** Monterosato, 1884.

METAXIA DIADEMA Bartsch, 1907; four specimens.

Living, Monterey—San Diego, California.

Family CERITHIIDAE.

Genus ALABINA Dall, 1902.

ALABINA CALIFORNICA Dall and Bartsch, 1901; seven specimens.
Not known living.

Genus BITTIUM Gray, 1847.

Subgenus SEMIBITTIUM Cossmann, 1896.

BITTIUM ATTENUATUM Carpenter, 1864; numerous.

Living, Forrester Island, Alaska-San Diego, California.

BITTIUM RUGATUM Carpenter, 1866; plentiful.

Living, San Pedro and Catalina Islands, California.

Subgenus LIROBITTIUM Bartsch, 1911.

BITTIUM CATALINENSE Bartsch, 1907; two specimens.

Living at Catalina Island and San Diego.

BITTIUM ORNATISSIMUM Bartsch, 1911; very plentiful.

Living at San Pedro.

BITTIUM ASPERUM Gabb, 1861; one specimen.

Living, Santa Barbara to San Diego, California.

Family CAECIDAE.

Genus CAECUM Fleming, 1817.

CAECUM CALIFORNICUM Dall, 1885; one specimen.

Living, Monterey, California-Lower California.

Genus MICRANELLUM Bartsch, 1920.

MICRANELLUM CREBRICINCTUM Carpenter, 1864; plentiful.

Living, Monterey, California-Todos Santos Bay, Lower California.

Genus FARTULUM Carpenter, 1858.

FARTULUM HEMPHILLI Bartsch, 1920; not rare.

Living, San Pedro, California-Point Abreojos, Lower California.

Family VERMETIDAE.

Genus ALETES Carpenter, 1857.

ALETES SQUAMIGERUS Carpenter, 1856; very plentiful.

Living, Monterey, California-Payta, Peru, and the Galapagos Islands.

ALETES SQUAMIGERUS PENNATUS Mörch, 1862; plentiful.

Living, San Pedro, California, and north.

Family TURRITELLIDAE.

Genus TURRITELLA Lamarck, 1799.

TURRITELLA COOPERI Carpenter, 1866; twenty specimens.

Living, Monterey-San Diego, California.

Family LITTORINIDAE.

Genus LITTORINA Ferussac, 1822.

Section LITTORIVAGA Dall, 1918.

LITTORINA PLANAXIS Philippi, 1847; twenty specimens.

Living, Puget Sound—Magdalena Bay, and Socorro Islands.

Subgenus MELARHAPHE (Mühlfeldt) Menke, 1828.

LITTORINA SCUTULATA Gould, 1849; not rare.

Living, Kodiak Island, Alaska—Turtle Bay, Lower California.

Family LACUNIDAE.

Genus LACUNA Turton, 1827.

LACUNA SOLIDULA Lovén, 1846; two specimens.

Living, Puget Sound—San Diego, California. Also Atlantic.

LACUNA UNIFASCIATA AURANTIACA Carpenter, 1856; not rare.

Living, Santa Barbara, California—Point Abreojos, Lower California

Family FOSSARIDAE.

Genus ISELICA Dall, 1918.

ISELICA FENESTRATA Carpenter, 1864; very plentiful.

Living, Puget Sound—Gulf of California.

Family ?-

Genus DIALA A. Adams, 1861.

DIALA ACUTA Carpenter, 1864; not rare.

Living, Puget Sound—San Diego, California.

Family RISSOIDAE.

Genus ALVANIA (Leach) Risso, 1826.

ALVANIA MONTEREYENSIS Bartsch, 1911; about fifty specimens.

Living, Sitka, Alaska—Monterey, California.

ALVANIA AEQUISCULPTA Keep, 1887; one specimen.

Living, Catalina Island—Todos Santos Bay, Lower California.

Genus PALUDESTRINA Orbigny.

PALUDESTRINA CURTA Arnold, 1903; not rare.

Not reported living.

PALUDESTRINA cf. STOKESI Arnold, 1903; eight specimens.

Not reported living. Specimens too worn for identification.

Family RISSOINIDAE.

Genus RISSOINA Orbigny, 1840.

RISSOINA KELSEYI Dall and Bartsch, 1902; two specimens.

Living, San Pedro, California—Coronado Islands.

RISSOINA DALLI Bartsch, 1915; two specimens.

Living, San Pedro, California—South Coronado Island.

Family TRUNCATELLIDAE.

Genus **TRUNCATELLA** (Leach, 1818) Risso, 1826.

TRUNCATELLA CALIFORNICA Pfeiffer, 1857; five specimens.

Living, Santa Barbara—San Diego and San Martin Island, Lower California.

Family SYNCERATIDAE.

Genus **SYNCERA** Gray, 1821.

SYNCERA TRANSLUCENS Carpenter, 1864; eight specimens.

Living, Vancouver Island—Lower California.

Family HIPPONICIDAE.

Genus **HIPPONIX** Defrance, 1819.

HIPPONIX ANTIQUATUS Linnaeus, 1767; five specimens.

Living, Crescent City, California—Panama and the Galapagos Islands.

HIPPONIX ANTIQUATUS CRANIODES Carpenter, 1864; one specimen.

Living, Vancouver Island—San Pedro, California.

HIPPONIX TUMENS Carpenter, 1865; three specimens.

Living, Crescent City, California—San Diego, California.

Family CREPIDULIDAE.

Genus **CREPIDULA** Lamarck, 1801.

Section **CREPIDULA** s. s.

CREPIDULA ONYX Cowerby, 1825; four very small specimens.

Living, Monterey, California—Panama.

CREPIDULA EXCAVATA Broderip, 1834; six specimens.

Living, Monterey, California—Payta, Peru.

CREPIDULA ADUNCA Sowerby, 1825; quite plentiful.

Living, Vancouver Island—Cape San Lucas, Lower California.

CREPIDULA ACULEATA Gmelin, 1792; eight specimens.

Living, Santa Barbara, California—Valparaiso, Chile.

CREPIDULA DORSATA Broderip, 1834; six specimens.

Living, Puget Sound—Peru and South America.

Subgenus **IANACUS** Mörch, 1852.

CREPIDULA NUMMARIA Gould, 1846; plentiful.

Living, Bering Sea—Mazatlan, Mexico.

Family CALYPTRAEIDAE.

Genus **CALYPTRAEA** Lamarck, 1799.

CALYPTRAEA FASTIGIATA Gould, 1846; nine specimens.

Living, Port Etches, Alaska—Puget Sound.

Family NATICIDAE.

Genus POLINICES Montfort, 1810.

Subgenus EUSFIRA Agassiz, 1842.

POLINICES cf. LEWISII Gould, 1847; not rare, all specimens small and decorticated.

Living, the type form at Vancouver Island—Santa Barbara Islands, California.

Subgenus NEVERITA Risso, 1826.

POLINICES RECLUZIANA ALTA Dall, 1909; not rare.

Living, Monterey—Catalina Island.

Genus SINUM Bolten, 1798.

SINUM CALIFORNICUM L. S. Oldroyd, 1917; two specimens.

Living, Monterey, California—Lower California.

Family ACMAEIDAE.

Genus ACMAEA Eschscholtz, 1830.

Section COLLISELLA Dall, 1871.

ACMAEA SCUTUM PATINA Eschscholtz, 1833; not rare, all very small.

Living, Bering Sea—Gulf of California.

ACMAEA LIMATULA Carpenter, 1866; not rare, all quite small.

Living, British Columbia—Lower California.

ACMAEA SCABRA Gould, 1846; twelve specimens.

Living, San Francisco—Lower California.

ACMAEA INCESSA Hinds, 1842; quite plentiful.

Living, Trinidad, California—Magdalena Bay, Lower California.

ACMAEA ASMI Middendorf, 1849; not rare.

Living, Sitka, Alaska—San Diego, California, and Socorro Island.

ACMAEA DEPICTA Hinds, 1847; not rare.

Living, Santa Barbara—Lower California.

ACMAEA PALEACEA Gould, 1851; ten specimens.

Living, Trinidad, California—Lower California.

Genus LOTTIA Gray, 1834.

LOTTIA GIGANTEA Gray, 1834; five specimens, all very small.

Living, Washington—Guadalupe and Cerrós Islands.

Family PHASIANELLIDAE.

Genus PHASIANELLA Lamarck, 1804.

Subgenus TRICOLIA Risso, 1826.

PHASIANELLA COMPTA Gould, 1856; very plentiful.

Living, Monterey—Gulf of California.

PHASIANELLA PULLOIDES ELATIOR Carpenter, 1865; ten specimens.

Living, Catalina Island—Panama.

Family TURBINIDAE.

Genus *ASTRAEA* Bolten, 1798.

- Subgenus *PACHYPOMA* Gray, 1850.

ASTRAEA INAEQUALIS PACIFICA Dall, 1919; one specimen and sixteen opercula.
Living, Off Santa Cruz Island, California, in 30 fathoms.

Genus *LEPTOTHYRA* (Carpenter) Pease, 1869.

LEPTOTHYRA CARPENTERI Pilsbry, 1888; twelve specimens.

Living, Sitka, Alaska—San Diego, California.

LEPTOTHYRA BACULA Carpenter, 1864; one specimen.

Living, Puget Sound—San Martin Islands, Lower California.

LEPTOTHYRA PAUCICOSTATA Dall, 1871; thirteen specimens.

Living, Monterey—Coronado Islands.

Family TROCHIDAE.

Genus *HALISTYLUS* Dall, 1889.

HALISTYLUS SUBPUPOIDEUS Tryon, 1888; one specimen.

Living, Queen Charlotte Islands, British Columbia—Panama.

Genus *TEGULA* Lesson, 1832.Section *CHLOROSTOMA* Swainson, 1840.

TEGULA FUNEBRALIS A. Adams, 1854; fifteen specimens.

Living, Vancouver Island—Cerro Islands, Lower California.

TEGULA MONTEREYI Kienner, 1850; seven specimens.

Living, Vancouver Island—Channel Islands, Lower California.

TEGULA LIGULATUS Menke, 1850; one specimen.

Living, Monterey, California—Acapulco, Mexico.

Genus *CALLIOSTOMA* Swainson, 1840.

CALLIOSTOMA CANALICULATUM Martyn, 1784; ten specimens.

Living, Sitka, Alaska—San Diego, California.

CALLIOSTOMA CANALICULATUM Martyn, 1784; ten specimens.

Living, Sitka, Alaska—San Diego, California.

Genus *MARGARITES* Leach, 1847.Subgenus *LIRULARIA* Dall, 1909.

MARGARITES PARCIPICTA PEDROANA Arnold, 1903; plentiful.

Not reported living.

MARGARITES MAGNA, new species; most plentiful.

Not known living.

MARGARITES LIRULATA Carpenter, 1864; two specimens.

Living, Alaska—San Diego, California.

MARGARITES OPTABILIS Carpenter, 1864; one specimen.

Living, Santa Barbara—San Pedro, California.

Family VITRINELLIDAE.

Genus VITRINELLA C. B. Adams, 1850.

VITRINELLA OLDROYDI Bartsch, 1907; one specimen.

Living, on mantle of Chitons, Monterey, California—Lower California.

VITRINELLA ESHNAURI Bartsch, 1907; two specimens.

Living, San Pedro, California.

VITRINELLA THOMASI Bartsch, 1913; two specimens.

Not reported living.

Section DOCOMPHALA Bartsch, 1907.

VITRINELLA STEARNSII Bartsch, 1907; five specimens.

Living, Monterey, California.

Genus TEINOSTOMA A. Adams, 1854.

TEINOSTOMA INVALLATUM Carpenter, 1864; twenty specimens.

Living, Monterey, California—Gulf of California.

Family FISSURELLIDAE.

Genus FISSURELLA Bruguière, 1791.

FISSURELLA VOLCANO Reeve, 1849; two specimens.

Living, Crescent City, California—Panama.

Genus MEGATEBENNUS Pilsbry, 1850.

MEGATEBENNUS BIMACULATUS Dall, 1871; nine specimens.

Living, Forrester Island Alaska Cape San Lucas, Lower California.

Genus DIADORA Gray, 1821.

DIADORA ASPERA Eschscholtz, 1833; ten specimens.

Living, Cook's Inlet Alaska—Magdalena Bay, Lower California.

DIADORA MURINA (Carpenter's MS.) Dall, 1885; two specimens.

Living, Crescent City, California—Magdalena Bay, Lower California.

Genus PUNCTURELLA Lowe, 1827.

PUNCTURELLA CUCULLATA Gould, 1846; two specimens.

Living, Kodiak Island, Alaska—La Paz, Lower California.

Family LEPIDOCHITONIDAE.

Genus LEPIDOCHITONA Gray, 1821.

Section LEPIDOCHITONA s. s.

LEPIDOCHITONA DENTIENS Gould, 1884; about thirty valves.

Living, Puget Sound—Lower California.

Genus NUTTALLINA Carpenter, 1873.

NUTTALLINA CALIFORNICA Reeve, 1847.

Living, Straits of Fuca—San Diego, California.

Family ISCHNOCHITONIDAE.

Genus ISCHNOCHITON Gray, 1847.

Subgenus STENOPLAX Carpenter, 1878.

ISCHNOCHITON FALLAX Carpenter, 1892; one valve.

Living, Vancouver Island-Todos Santos Bay, Lower California.

Section LEPIDOZONA Pilsbry, 1892.

ISCHNOCHITON COOPERI Carpenter, 1892; three valves.

Living, Mendocino County, California-Catalina Island.

Genus CALLISTOCHITON Carpenter, 1882.

CALLISTOCHITON PALMULATUS MIRABILIS Pilsbry, 1892; two valves.

Living, San Diego, California.

CALLISTOCHITON CRASSICOSTATUS Pilsbry, 1892; eleven valves.

Living, Forrester Island, Alaska-San Diego, California.

Family MOPALIIDAE.

Genus MOPALIA Gray, 1847.

MOPALIA MUSCOSA Gould, 1846; six valves.

Living, Shumagin Islands, Alaska-Rosario, Lower California.

MOPALIA MUSCOSA ACUTA Carpenter, 1855; twenty valves.

Living, Santa Barbara-San Diego, California.

Family CRYPTOCHITONIDAE.

Genus CRYPTOCHITON Middendorff, 1847.

CRYPTOCHITON STELLERI Middendorff, 1847; not rare.

Living, Bering Island, Aleutian Islands-San Miguel and San Nicolas Islands.

LAND AND FRESHWATER SPECIES.

Family ZONITIDAE.

Genus ZONITOIDES Lehmann, 1846.

ZONITOIDES ARBOREUS Say, 1817; two specimens.

Living Vancouver Island-Oregon.

Family HELICIDAE.

Genus PYRAMIDULA Fleming, 1833.

PYRAMIDULA CRONKHITI Newcomb, 1865; one specimen.

Living, Alaska-Oregon.

Family LYMNAEIDAE.

Genus PLANORBIS Muller, 1774.

PLANORBIS TRIVOLVIS Say, 1817.

Living all along the coast.

PLANORBIS DEFLECTUS Say, 1824; one specimen.

With the last, living.

CRAB REMAINS IDENTIFIED BY MISS MARY J. RATHBUN.

Lophopanopeus leucomanus Lockington.

Twelve major and two minor dactyls, twenty-three immovable fingers.

Lophopanopeus diegensis Rathbun.

Sixty-three minor dactyls and seventy immovable fingers.

Lophopanopeus lockingtoni Rathbun.

Nine movable fingers.

Hemigrapsus oregonensis Dana.

One hundred and twenty movable and fourteen immovable fingers.

Hemigrapsus nudus Dana.

Nineteen movable and eleven immovable fingers.

Cancer productus Randall.

Seventeen movable and sixty-six immovable fingers.

Cancer gracilis Dana.

Two movable fingers.

Randallia ornata (Randall) and*Randallia*, new species.

Fifteen arm joints.

Callianassa, new species.

Eight dactyls of ambulatory legs.

Mesorhoea, new species.

Two hands, one arm.

SPINES AND FRAGMENTS OF SEA URCHINS, EITHER OR BOTH OF THE FOLLOWING TWO SPECIES.

Strongylocentrotus franciscanus A. Agassiz.*Strongylocentrotus purpuratus* Stimpson.*Dendraster excentricus* Eschscholtz.

Plentiful.

OTHER INVERTEBRATA.

Foraminifera, three species.

Bryozoa, four species, two of which are very plentiful, and also plentiful, living in Puget Sound.

DESCRIPTIONS OF NEW FORMS.

ACTEOCINA PEDROENSIS, new species.

Plate 2, fig. 9.

Shell large, slightly pyriform, with a small prominent subcylindrical nucleus of about two whorls and five subsequent whorls; suture narrowly channeled; the external surface is decorticated in all the specimens, but appears to have been smooth, the surface remaining shows faint spiral feebly punctate striae with rather wide inter-

spaces, all of which sculpture may have been concealed in the perfect shell; aperture slightly shorter than the last whorl; outer lip sharp, very slightly protractively arcuate, receding anteriorly and deeply rounded into the pillar lip, which is thickened and provided with a prominent sharp plait; body with a smooth coat of enamel; length of shell, 20; of last whorl, 18.5; of aperture, 16; maximum diameter, 10 mm.

Type.—Cat. No. 352346, U.S.N.M.

This is larger than any other species of the coast and is less cylindrical than *A. culcitella* Gould, the most nearly allied species. A specimen which has lost the nucleus is 23 mm. long and 10.5 mm. in diameter.

MARGINELLA JEWETTII NANELLA, new subspecies.

Plate 2, fig. 8.

Shell much like typical *jewettii* but uniformly smaller, more slender proportionately, somewhat less wide at the shoulder, and while *jewettii* usually has five plaits, including that on the edge of the pillar, this variety when adult often has as many as eight. Relative dimensions are:

M. jewettii; length, 5.5; maximum diameter, 4.5 mm.

M. nanella; length, 5.0; maximum diameter, 3.7 mm.

Type.—Cat. No. 352361, U.S.N.M.

Many *M. jewettii* are larger than the average specimen above cited, but the size of specimens of the fossil variety is surprisingly uniform. Many specimens of the latter have been examined.

ALLA TUBEROSA MAJOR, new subspecies.

Plate 2, fig. 11.

Shell like the typical recent form, with the same number of whorls but uniformly much larger. Comparative measurements for specimens of eight whorls are:

A. tuberosa; length, 8; maximum diameter, 3.8 mm.

Var. *major*; length, 11; maximum diameter, 5.0 mm.

Type.—Cat. No. 352369, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) PECORA, new species.

Plate 1, fig. 6.

Shell of medium size, elongate turritid, yellowish white. Nuclear whorls two and a half, forming a somewhat depressed helicoid spire, the axis of which is at right angles to that of the succeeding turns, in the first of which the tilted edge of the last whorl is one-fifth immersed. Postnuclear whorls almost flattened, almost tabulately shouldered at the summit, marked by strong, decidedly protractively

slanting axial ribs, of which 14 occur upon the first, second, and third, 16 upon the fourth, fifth, and sixth, 18 upon the seventh to eleventh, and 22 upon the penultimate turn. These ribs extend quite prominently to the summit of the whorls, which they render slightly crenulated. The intercostal spaces are about as wide as the ribs, terminating a little posterior to the suture, which leaves a narrow, smooth band immediately above the well-constricted suture. Periphery of the last whorl well rounded. Base short, well rounded, marked by the feeble continuations of the axial ribs, which evanesce shortly after passing the periphery. The entire surface of the shell is marked by fine, closely spaced spiral striations. Aperture broadly oval; posterior angle obtuse; outer lip thin; inner lip slightly curved, reflected over and appressed to the base for its anterior third, and provided with an obsolete fold a little anterior to its insertion.

Type.—Cat. No. 333506, U.S.N.M., has 12.5 whorls and measures: length, 8.2 mm.; diameter, 2 mm. Cat. No. 352503 U.S.N.M. contains another specimen showing the nucleus.

Three additional specimens are in the Oldroyd collection.

The present species belongs to the group of *Turbonilla* (*Strioturbonilla*) *dinora*, *panamensis*, *schmitti*, and *buttoni*. It is less robust than *T. (S.) dinora* and has more ribs than that species, and is more robust than any of the other members of the group. The fine spiral striations have been omitted in the figure.

TURBONILLA (PYRGOLAMPROS) COLLISELLA, new species.

Plate 1, fig. 11.

Shell moderately large, elongate conic, yellowish, with a brownish suffusion which probably indicates that when living it was brown. Nuclear whorls two and a fifth, forming a somewhat depressed helioid spiral, the axis of which is almost at right angles to that of the succeeding turns, in the first of which the tilted edge of the nuclear spiral is about one-fifth immersed. Early postnuclear whorls moderately rounded, the later ones almost flattened, slightly shouldered at the summit, marked by almost vertical axial ribs. Of these ribs, which are much less strong and more numerous and more closely spaced on the early whorls than on the later, where they become senescent on the last turn, 24 occur on the second, 30 upon the third, 26 upon the fourth, 24 upon the fifth and sixth, 21 upon the seventh, eighth, and ninth, 28 upon the tenth, while on the last whorl they are decidedly irregular and irregularly spaced. The intercostal spaces vary in width, being very narrow on the early turns, moderately wide on the median and again on the later very narrow. Suture moderately constricted. Periphery of the last whorl well rounded, Base short, marked by the feeble continuations of the axial ribs,

which extend to the umbilical chink. Aperture rather large, broadly oval; posterior angle obtuse; outer lip thin; inner lip slightly curved and reflected, with the posterior third reflected over and appressed to the base. There is an oblique feeble fold on the columella a little anterior to its insertion.

Type.—Cat. No. 333507, U.S.N.M., has lost the nucleus and first two postnuclear turns. The 9.5 whorls remaining measure: Length, 12 mm.; diameter, 3.3 mm.

The nucleus and the first two postnuclear turns were described from a young specimen, Cat. No. 352507, U.S.N.M., having nine post-nuclear whorls, which measures: Length, 7.1 mm.; diameter, 2.2 mm.

Twenty-seven additional specimens are in the Oldroyd collection.

This species belongs near *Turbonilla* (*Pyrgolampros*). *hannibali*, Bartsch.

TURBONILLA (PYRGOLAMPROS) IDAE, new species.

Plate 1, fig. 9.

Shell of medium size, elongate conic, pale brown. Nuclear whorls two and a half, forming a very small, slightly elevated helicoid spiral, the axis of which is at right angles to that of the succeeding turns, in the first of which the tilted edge of the nuclear spiral is about one-fourth immersed. The first two or three post-nuclear whorls well rounded, the succeeding turns almost flattened, or sometimes evenly slightly concave. All the whorls very narrowly shouldered at the summit. The first postnuclear whorl smooth, the second one showing mere indications of axial riblets, while on the succeeding turns they become increasingly stronger, well rounded, and somewhat protractively slanting. Of these riblets, 20 occur upon the third, 18 upon the fourth to sixth, 20 upon the seventh, 22 upon the eighth, 24 upon the ninth, and 34 upon the last turn. On this they become less conspicuous. Intercostal spaces mere lines on the first turns, while on the median whorls they are about half as wide as the axial ribs, and on the last turn they are again materially reduced. Suture slightly constricted. Periphery of the last whorl somewhat inflated, well rounded. Base short, somewhat inflated, well rounded, marked by the feeble continuations of the axial riblets, which extend to the umbilical chink. The entire surface of the spire and base crossed by numerous, closely spaced spiral striations. Aperture broadly oval; posterior angle acute; outer lip thin; inner lip curved, rather strongly reflected, almost free throughout its entire length, posteriorly covering the greater portion of the umbilical chink. A feeble twist is present on the columella at its insertion.

Type.—Cat No. 333509, U.S.N.M., has lost the nucleus and the first nuclear turn. The nine remaining measure: Length, 7.9 mm.; diameter, 2.3 mm.

The nuclear turns were described from a young specimen, Cat. No. 352508, U.S.N.M.; 38 additional specimens are entered as Cat. No. 352533, U.S.N.M.; 150 are in the Oldroyd collection.

This specimen is related to *Turbonilla* (*Pyrgolampros*) *taylori*, Dall and Bartsch, but is much smaller than that species, and has more ribs. The fine spiral striations have been omitted in the figure.

TURBONILLA (PYRGISCUS) HIMERTA, new species.

Plate 1, fig. 1.

Shell moderately large, pale yellow. Nuclear whorls two and a half, well rounded, forming a decidedly repressed helicoid spiral, the axis of which is almost at right angles to that of the succeeding turns, in the first of which the tilted edge of the nuclear spiral is about one-fourth immersed. Postnuclear whorls narrowly shouldered at the summit, almost flattened in the middle, marked by 20 weak, slightly retractive curved, axial ribs on the first turn. On the second turn and the succeeding turns there are strong axial ribs, which have a protractive slant. Of these ribs, 18 occur upon the second to fifth, 20 upon the sixth, 24 upon the seventh, where they begin to have a slight retractive curve, while on the last turn there are 38, which have a decided retractive curve. The spaces separating these ribs are narrow on the first turn, about as wide as the ribs on the succeeding two, and a little wider than the ribs on the next two, while on the last they are a little narrower than the ribs. The spiral sculpture consists of a series of incised lines and pits. The widest pits are the line at the periphery, where the diameter equals the height. Another series of pits is about half the width of the peripheral, and occupies a space halfway between the summit and the periphery, while a third series of about equal width occupies the space a little nearer to the peripheral than the median line of pits. The two series of pits posterior to the median pits follow next in strength and are equal. In addition to this, there are incised spiral lines, of which the first is about half as far removed from the summit as it is from its neighbor anteriorly, the space between the first and second being equal to about one-sixth of the width between the summit and the periphery. The second, third, and fourth incised lines are equal and rather closely spaced. These are followed by the two medium-sized pits already referred to, posterior to the median pits, then by the median pits. The space between the median pit and the medium-sized pit anterior to it is crossed by two incised spiral lines, of which the first is a little

farther removed from the median pit than from its neighbor, while the second is closely approximated to the second pit. The space between the medium-sized pit and the peripheral pit is crossed by two lines, of which the first divides the space between the two, while the last is separated from the peripheral pit by a mere hair line. Periphery of the last whorl well rounded. Base marked by the feeble continuations of the axial ribs, which evanesce before reaching the umbilical chink, and 18 incised spiral lines of varying strength and spacing. Suture moderately constricted. Aperture broadly ovate; posterior angle acute; outer lip thin; inner lip concave, reflected over and appressed for half its length to the preceding turn, bearing a weak fold a little anterior to its insertion.

Type.—Cat. No. 333508, U.S.N.M., has lost the nucleus. The 8.75 whorls remaining measure: 6.4 mm.; diameter, 2 mm. The nuclear whorls were described from specimen, Cat. No. 352509 U.S.N.M.

Three additional specimens are in the Oldroyd collection.

This species belongs to the group of *Turbonilla* (*Pyrgiscus*) *auricoma* Dall and Bartsch, and *T. (P.) castanea* Keep.

TURBONILLA (MORMULA) EPIPHANEA, new species.

Plate 1, fig. 12.

Shell very large. (Nuclear whorls decollated in all the specimens seen.) Postnuclear whorls almost appressed at the summit, well rounded, marked by rather strong, almost vertical axial ribs, of which 14 occur upon the first of the remaining turns, 16 upon the second, 18 upon the third and fourth, 20 upon the fifth to seventh, 22 upon the eighth to tenth, 24 upon the eleventh, while on the succeeding turns they become enfeebled and finally obsolete. In addition to the axial ribs, low rounded varices, the result of the fusion of several ribs, occur at regular intervals. Intercostal spaces about twice as wide as the ribs, crossed by 8 almost equal, incised spiral lines, which, however, do not enclose equal spaces. The space between the first and second, second and third and sixth and seventh is about twice as wide as the space between the summit and the first, and those between the third and fourth and fourth and fifth, while the space between the fifth and sixth and seventh and eighth stand halfway between these in width. In addition to this, there are very finely incised lines in the spaces between the coarse incised lines. On the last turn, where the axial sculpture becomes obsolete, the spiral sculpture is also very irregular and many more incised lines are apparent. Periphery of the last whorl well rounded. Base short, well rounded, marked by the feeble continuations of the irregular axial ribs, which form mere threads, and in that fashion extend to the umbilical chink, and numerous closely spaced spiral striations.

Aperture subquadrate; posterior angle obtuse; outer lip thin, bearing three spiral lirae within; inner lip somewhat twisted, almost vertical, its edge reflected and appressed to the preceding whorl for one-third of its length.

Type.—Cat. No. 333510, U.S.N.M., has 14.5 whorls and measures: Length, 20.8 mm.; diameter, 4.9 mm.

Five additional specimens, Cat. No. 352510, U.S.N.M., are also in the National Museum collection, and 20 are in the Oldroyd collection.

This species is related to *Turbonilla (Mormula) tridentata* Carpenter, but is much larger than that species.

ODOSTOMIA (IVARA) AMAVA, new species.

Plate 1, fig. 7.

Shell elongate ovate, yellowish white. Nuclear whorls deeply immersed in the first of the postnuclear turns, above which the outer edge of the last whorl only projects. Postnuclear whorls very broadly flatly tabulated at the summit, with a sharp angle at the shoulder of the summit, the portion anterior to the shoulder moderately well rounded and crossed by feeble, almost vertical, axial ribs, of which 32 occur upon the third, while upon the last whorl they become decidedly irregular in strength and spacing. On the third whorl the spaces that separate the ribs are almost as wide as the ribs. In addition to the axial sculpture, the whorls are marked by spiral striations, which cause the spaces between them to appear as raised flattened cords. These are poorly defined on the first two turns in the type, while on the third there are eight between the summit and the suture and nine on the last whorl. Periphery of the last whorl well rounded. Base rather long, well rounded, marked by the feeble continuations of the axial ribs, and eight incised spiral lines, the combinations of the two forming a sculpture corresponding with that on the spire. Aperture elongate ovate; posterior angle rendered decidedly obtuse by the tabulated summit; outer lip thin; inner lip strongly curved, with a conspicuous fold at its insertion; parietal wall covered by a thin callus.

Type.—Cat. No. 352514, U.S.N.M., has 4.5 postnuclear whorls and measures: length, 3.8 mm.; diameter, 1.8 mm.

Compared with *Odostomia (Ivara) turricula* Dall and Bartsch, the present species is differentiated by its much more robust form and coarser sculpture.

ODOSTOMIA (CHRYSTALLIDA) GOMPHINA, new species.

Plate 1, fig. 3.

Shell very elongate ovate, yellowish white. Nuclear whorls deeply, obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last volution projects, which appears well

rounded and smooth. Postnuclear whorls well rounded, narrowly shouldered at the summit, marked by strong, decidedly retractorily slanting axial ribs, of which 18 occur upon the first, 20 upon the second, 22 upon the third, and 26 upon the last turn. In addition to the axial ribs, the whorls are crossed by 4 equal and equally spaced spiral cords, which are about as wide as the spaces that separate them. The first of these is at the summit. The intersection of the axial ribs and spiral cords forms strong, rounded tubercles which have their long axes, which are only slightly greater than the shorter, parallel with the spiral sculpture. Periphery of the last whorl marked by a spiral cord, which falls partly in the suture on the last two turns. Suture not channeled. Base moderately long, well rounded, with a narrow umbilical chink, marked by 10 spiral cords, which become successively narrower and closer spaced from the periphery to the umbilical chink. Aperture ovate; posterior angle acute; outer lip thin; inner lip strongly curved and decidedly reflected and appressed to the base, provided with a rather strong fold at the insertion of the columella; parietal wall covered with a rather thick callus, which alone renders the peritreme complete.

Type—Cat. No. 352515, U.S.N.M., has 5 postnuclear whorls and measures: Length, 3.2 mm.; diameter, 1.4 mm.

The present species is related to the recent group of which *Odostomia* (*Chrysallida*) *benthina* and *O. (C.) promeces* are members.

An additional specimen is in the Oldroyd collection.

ODOSTOMIA (CHRYSTALLIDA) SCELERA, new species.

Plate 1, fig. 4.

Shell elongate conic, yellowish white. Nuclear whorls small, deeply, obliquely immersed in the first of the postnuclear turns, above which the tilted edge of the last volution only projects. Postnuclear whorls strongly shouldered at the summit, marked by very strong, retractorily slanting axial ribs, of which 14 occur upon the second and third, 16 upon the fourth, and 20 upon the last turn. In addition to the axial ribs, the whorls are marked by 4 strong spiral cords, which are not quite equal to the axial ribs in strength, and which render the junction with the axial ribs strongly nodulose, the nodules being a little longer than wide. The spaces inclosed between the axial ribs and spiral cords are rectangular pits. Periphery of the last whorl marked by a strong cord, separated from the last cord on the spire by a channel as wide as that separating the other cords of the spire, and crossed by the continuations of the axial ribs which terminate at the posterior border of the peripheral cord. Suture strongly channeled. Base feebly rounded, marked by four spiral

cords, which are successively closer spaced and weaker from the posterior anteriorly, the fourth being really a broad, tumid area, surrounding the umbilical chink. The broad channels separating these cords are crossed by numerous slender axial threads. Aperture oval; posterior angle acute; outer lip thin at the edge, thick within; inner lip curved, reflected over and appressed to the preceding turn, provided with a strong, oblique fold at its insertion; parietal wall covered by a thick callus.

Type.—Cat. No. 352516, U.S.N.M., has 5 whorls and measures: Length, 3.2 mm.; diameter, 1.5 mm.

This is most nearly related to *Odostomia (Chrysallida) heterocincta* Bartsch, from which it is at once distinguished by its more robust size and less acutely tuberculated sculpture.

Cat. No. 352517, U.S.N.M., contains 2 more specimens from the type locality, and 6 additional specimens are in the Oldroyd collection.

ODOSTOMIA (EVALEA) TERSA, new species.

Plate 1, fig. 10.

Shell elongate conic, yellowish white. Nuclear whorls deeply, obliquely immersed in the first of the postnuclear whorls, above which only the tilted edge of the last volution projects. Postnuclear whorls rather high between summit and suture, slightly rounded, narrowly shouldered at the summit and marked only by lines of growth and very fine spiral striations. Suture slightly constricted. Periphery of the last whorl well rounded. Base slightly inflated, rather long, narrowly umbilicated, marked like the spire. Aperture long, oval; posterior angle acute; outer lip thin at the edge, thick within; inner lip oblique, slightly sinuous, provided with a strong fold opposite the umbilical chink; parietal wall covered by a moderately thick callus.

Type.—Cat. No. 352518, U.S.N.M., has 5 postnuclear whorls remaining, having lost probably the first half of the postnuclear turn, and measures: Length, 5 mm.; diameter, 2 mm.

Cat. No. 352519, U.S.N.M., contains 2 specimens from the type locality, one of which served for description of the nucleus. Four additional specimens are in the Oldroyd collection.

The present species recalls *Odostomia (Evalea) valdesi* Dall and Bartsch, but is more than double the size of that species in every way. The fine spiral striations have been omitted in the figure.

ODOSTOMIA (EVALEA) ITHEA, new species.

Plate 1, fig. 2.

Shell regularly broadly conic, yellowish white. Nuclear whorls small, obliquely immersed in the first postnuclear turn, above which

only the tilted edge of the last turn projects. Postnuclear whorls slightly rounded, narrowly shouldered at the summit, marked by fine lines of growth and rather coarse spiral striations. Suture slightly constricted. Periphery of the last whorl rounded. Base short, well rounded, somewhat inflated, narrowly umbilicated, and marked like the spire. Aperture moderately long, oval; posterior angle acute; outer lip thin at the edge, thick within; inner lip strongly curved, with a strong fold opposite the umbilical chink; parietal wall covered by a thin callus.

Type.—Cat. No. 352520, U.S.N.M., has 6.5 postnuclear whorls and measures: Length, 5.6 mm.; diameter, 2.4 mm.

An additional specimen is in the Oldroyd collection.

This species suggests *Odostomia (Evalea) youngi* Dall and Bartsch, but is distinguished from this at once by its more broadly conic outline.

ODOSTOMIA (EVALEA) MANCA, new species.

Plate 1, fig. 5.

Shell very elongate ovate, yellowish white. Nuclear whorls small, deeply, obliquely immersed in the first of the postnuclear whorls, above which only the tilted edge of the last volution projects. Postnuclear whorls slightly rounded, very narrowly shouldered at the summit, marked by fine lines of growth and moderately strong spiral striations. Suture slightly constricted. Periphery of the last whorl slightly inflated, well rounded. Base short, well rounded, not umbilicated, marked like the spire. Aperture elongate oval; posterior angle acute; outer lip thin; inner lip slightly curved, reflected, and appressed for half its length to the base, provided with a strong fold at its insertion; parietal wall covered by a moderately thick callus.

Type.—Cat. No. 352521, U.S.N.M., has 6 postnuclear whorls and measures: Length, 5.5 mm; diameter, 2.3 mm.

Cat. No. 352522, U.S.N.M., contains 10 additional specimens from the type locality, and there are 49 in the Oldroyd collection.

The present species recalls *Odostomia (Evalea) resina* Dall and Bartsch, which is fully four times as large.

ODOSTOMIA (EVALEA) CIVITELLA, new species.

Plate 2, fig. 7.

Shell rather large, milk white. Nuclear whorls small, deeply immersed in the first of the succeeding turns, above which the tilted edge of the last volution alone projects. Postnuclear whorls moderately well rounded, narrowly shouldered at the summit, marked by numerous rather regular lines of growth and rather coarse spiral striations, which cause the space between these striations to appear

like slender lirations, and lend to the surface a reticulated appearance. Suture well constricted. Periphery slightly angulated at the early whorls, but rounded on the last. Base very narrowly umbilicated, slightly inflated, well rounded, and marked like the spire. Aperture broadly oval; posterior angle acute; outer lip thin at the edge, thick within; inner lip strongly curved, reflected over but not appressed to the base, provided with a strong, oblique fold opposite the umbilical chink; parietal wall covered with a thin callus.

Type.—Cat. No. 352523, U.S.N.M., has almost 6 postnuclear whorls and measures: Length, 6 mm.; diameter, 2.7 mm.

Cat. No. 352524, U.S.N.M., contains 5 additional specimens from the type locality, and there are 10 in the Oldroyd collection.

This species, while it belongs to the coarsely sculptured group of *Evalea*, does not seem to be very closely related to any of the described forms.

ODOSTOMIA (EVALEA) FITELLA, new species.

Plate 1, fig. 8.

Shell very regularly elongate conic, yellowish white. Nuclear whorls rather large, deeply, obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last volution projects. Postnuclear whorls well rounded, very narrowly shouldered at the summit, marked by fine lines of growth and fine spiral striations. Suture slightly constricted. Periphery of the last whorl slightly angulated. Base short, well rounded, somewhat inflated, broadly umbilicated, marked like the spire. Aperture elongate ovate; posterior angle acute; outer lip thin at the edge; inner lip almost straight, reflected but not appressed to the base; parietal wall covered by a thick callus, which renders the peritreme complete.

Type.—Cat. No. 352525, U.S.N.M., has 6.5 postnuclear whorls and measures: Length, 5.9 mm.; diameter, 2.5 mm.

Cat. No. 352526, U.S.N.M., contains 2 specimens from the type locality, and there are 4 additional in the Oldroyd collection.

The present species has no near relatives among the recent shells so far described.

ODOSTOMIA (AMAURO) MENZOLA, new species.

Plate 2, fig. 6.

Shell small, elongate ovate. Nuclear whorls obliquely immersed in the first of the postnuclear turns, above which only the tilted edge of the last volution projects. Postnuclear whorls slightly rounded, narrowly shouldered at the summit, marked by retractorily slanting lines of growth and microscopic spiral striations. Suture well

marked, slightly constricted. Periphery of the last whorl and the short base well rounded and inflated, the latter narrowly umbilicated and marked like the spire. Aperture very broadly ovate; posterior angle obtuse; outer lip thin at the edge; inner lip somewhat sinuous, reflected over but not appressed to the base, provided with a strong oblique fold; parietal wall glazed with a thin callus.

Type.—Cat. No. 352527, N.S.N.M., has 6 postnuclear whorls and measures: Length, 6.2 mm.; diameter, 3 mm.

Cat. No. 352528, U.S.N.M., contains 5 specimens from the type locality and there are 10 additional specimens in the Oldroyd collection.

This form is related to *Odostomia (Amaura) helenae* Bartsch, but is about double the size of that species. The fine spiral striations have been omitted in the figure.

ODOSTOMIA (AMAURA) TROCHILIA, new species.

Plate 2, fig. 1.

Shell broadly ovate, yellowish white. Nuclear whorls deeply, obliquely immersed in the first of the postnuclear turns, above which the tilted edge of the last volution alone projects. Postnuclear whorls well rounded, narrowly tabulately shouldered at the summit, marked only by lines of growth and microscopic spiral striations. Suture constricted. Periphery of the last whorl and the short, narrowly umbilicated base well rounded, marked like the spire. Aperture large, ovate; posterior angle acute; outer lip thin at the edge, thick within; inner lip somewhat sinuous, reflected over but not appressed to the base, provided with a strong oblique fold a little anterior to the insertion of the columella; parietal wall glazed by a thin callus.

Type.—Cat. No. 352529, U.S.N.M., has 5.5 postnuclear whorls and measures: Length, 6.6 mm.; diameter, 3.2 mm.

The present form is nearest related to *Odostomia (Amaura) engbergi* Bartsch, from which it differs by its less rounded whorls and little more acutely tabulated shoulder.

An additional specimen, Cat. No. 352530, U.S.N.M., is likewise in the collection. The fine spiral striations have been omitted in the figure.

ODOSTOMIA (AMAURA) SANESIA, new species.

Plate 1, fig. 13.

Shell moderately large, elongate conic, yellowish white. Nuclear whorls deeply, obliquely immersed in the first of the succeeding turns. Postnuclear whorls well rounded, narrowly shouldered at the summit, marked by coarse lines of growth and microscopic spiral striations. Suture moderately constricted. Base short, inflated, with an

umbilical chink, but not openly umbilicated, marked like the spire. Aperture short; broadly oval; posterior angle acute; outer lip thin at the edge; inner lip strongly curved, slightly sinuous, provided with a very strong oblique fold a little anterior to the insertion of the columella; parietal wall covered by a thin callus.

Type.—Cat. No. 352531, U.S.N.M., has 6.3 postnuclear whorls and measures: Length, 8.7 mm.; diameter, 4 mm.

An additional specimen is in the Oldroyd collection.

The present form is related to *Odostomia* (*Amaura*) *sanjuanensis* Dall and Bartsch, but differs from it by its larger size and a little less sloping shoulder, as well as minor sculptural characters. The fine spiral striations have been omitted in the figure.

ODOSTOMIA (AMAURO) TIMESSA, new species.

Plate 2, fig. 4.

Shell large, elongate conic, broadly umbilicated, yellowish white. Nuclear whorls deeply, very obliquely immersed in the first post-nuclear turn, above which only the tilted edge of the last volution projects. Postnuclear whorls well rounded, narrowly shouldered at the summit, marked by numerous lines of growth and very fine spiral striations. Suture somewhat constricted. Periphery of the last whorl inflated, well rounded. Base strongly inflated, well rounded, marked like the spire. Aperture large; posterior angle acute; outer lip thick within; inner lip curved and provided with a strong oblique fold a little anterior to its insertion; parietal wall covered by a thin callus.

Type.—Cat. No. 352532, U.S.N.M., has almost 7 postnuclear whorls and measures: Length, 7.4 mm.; diameter, 3.2 mm.

Two additional specimens are in the Oldroyd collection.

This species is related to *Odostomia* (*Amaura*) *washingtona* Bartsch, but is in every way smaller than that species. The fine spiral striations have been omitted in the figure.

EPITONIUM CONTINUATUM, new species.

Plate 2, fig. 10.

Shell small, acute, with a smooth nucleus of two, and six and a half subsequent well rounded whorls; suture deep but not solute; with twelve vertical sharp varices continuous over the suture and making nearly a complete circuit around the spire; there is no angle on the varices at the shoulder and no spiral sculpture or basal disk; the aperture is subovate and the base imperforate; length of shell, 8; of last whorl, 3.6; maximum diameter, 3.5 mm.

Type.—Cat. No. 352383, U.S.N.M.

One specimen was obtained.

LIRULARIA MAGNA, new species.

Plate 2, figs. 2, 3, and 5.

Shell large for the group, trochiform, originally mottled on the prominences with dark and light articulation, with a small smooth nucleus and about five whorls; suture distinct, very narrow; whorls very slightly convex; periphery rounded; spiral sculpture of (on the last whorl behind the periphery four or five, and on the base as many more) rather prominent threads with much wider interspaces; there is also more or less fine spiral striation; axial sculpture of fine regular silky retractorily oblique incremental lines; the spiral threads, especially on the earlier whorls, are sometimes obscurely beaded; the base is moderately convex with a small funicular umbilicus, axially striate; aperture rounded, oblique, the margins simple, with no internal lirae; height of shell, 10; of last whorl, 6; maximum diameter, 8 mm.

Type.—Cat. No. 352410, U.S.N.M.

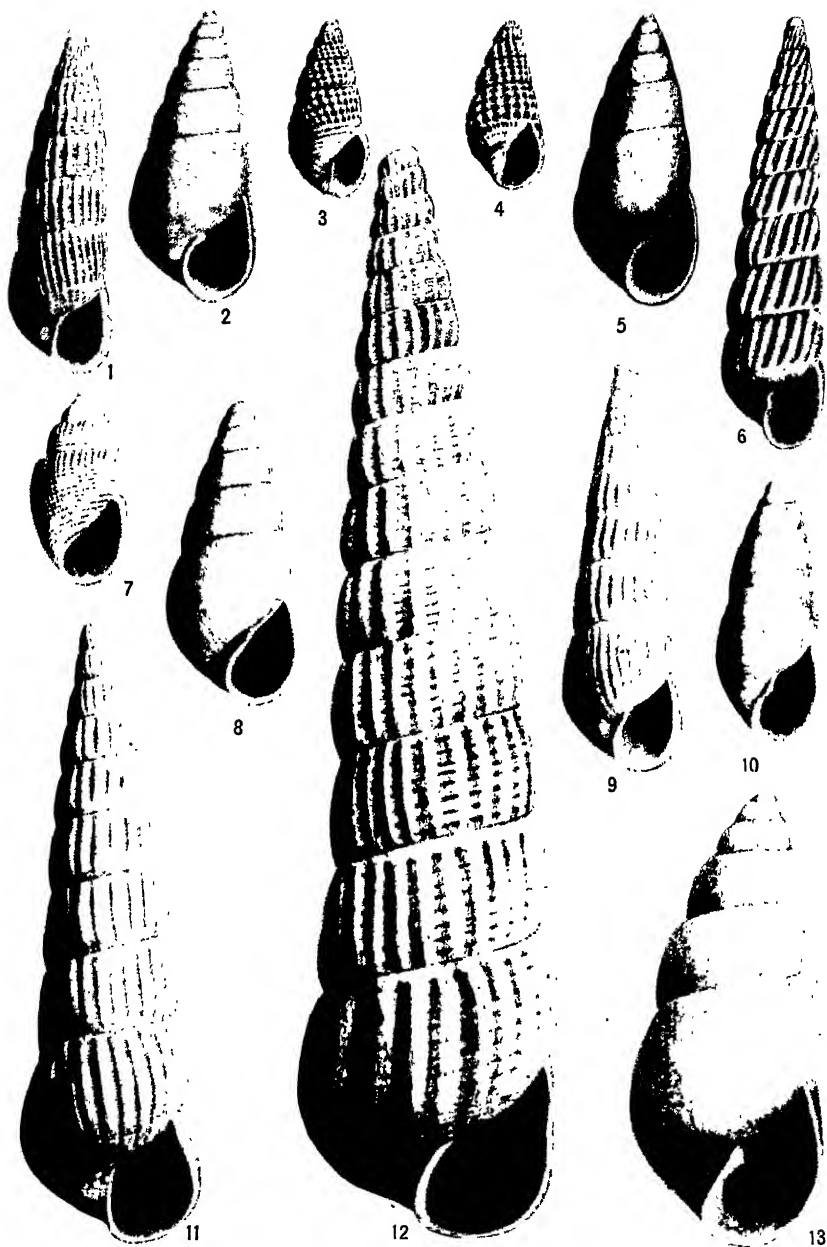
There is some variation in the height of the specimens, some being slightly more elevated than others in proportion to their diameter. The species is the largest of the group yet known.

EXPLANATION OF PLATES.

All figures are photographs of the types.

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LOWER SAN PEDRO PYRAMIDELLIDS

FOR DESCRIPTION OF PLATE SEE PAGE 38



LOWER SAN PEDRO FOSSIL SHELLS

FOR DESCRIPTION OF PLATE SEE PAGE 39

PLATE 2.

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A NEW MARINE ANNELID FROM CHILE.

By A. L. TREADWELL,

Of the Department of Zoology, Vassar College, Poughkeepsie, New York.

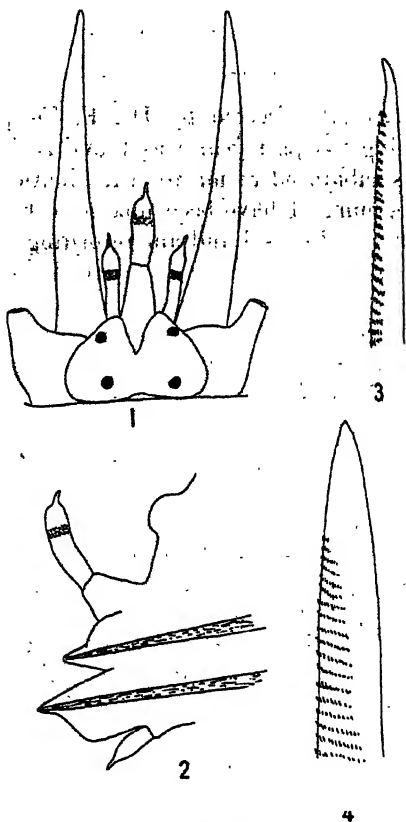
Among other material collected by Dr. F. Felippone, at Punta Arenas, Chile, during the past year was found a single, incomplete annelid, which was submitted to me for examination by the United States National Museum. I have been unable to find this described in any literature at my disposal and am recording it here as a new species, though because of the imperfect condition of the specimen the specific description must be incomplete. It has been included under *Lagisca*, because of the form of the prostomium, the fact that the neuropodial setae are smaller than the notopodial and have transverse denticulations, and on the assumption that only a small portion of the posterior end is missing.

LAGISCA CRASSA, new species.

The prostomium (fig. 1) is much broader than long, and is divided anteriorly by a deep V-shaped incision which extends half way of the length of the prostomium. From its posterior angle a slight dorsal depression continues posteriorly for the remainder of the prostomium. The result of this structure is that the prostomium is divided into halves, each roughly ovate in outline with its outer margin decidedly rounded toward its posterior end. From the point of greatest width the lateral margins slope gradually toward the anterior end where they meet with the inner margins which form the edges of the V. These two margins meet at a blunt angle but do not form a decided "peak." The eyes are all of approximately the same size, the posterior pair situated near the dorsal mid-line of the corresponding half of the prostomium a little posterior to its center. The anterior eyes are a very little farther apart than the posterior, and situated near the anterior margins.

The median tentacle has a stout cirrophore which completely fills the above-mentioned V in the prostomium, and is about as long as the prostomium. The terminal joint is about as long as the cirro-

phore, is rather thick, and terminates in a fine filament arising from the abruptly narrowing end of the tentacle. The lateral tentacles are much shorter and more slender than the median, but have approximately the same form. The palps are six to eight times as long as the prostomium and rather heavy. In the specimen they are very much wrinkled, a condition probably a result of the preservation. The tentacular cirri are like the tentacles in form but are



LAGISCA CRASSA, NEW SPECIES. FIG. 1, ANTERIOR END $\times 10$; FIG. 2, PARAPODIUM $\times 17$; FIG. 3, NEUROPODIAL SETA $\times 170$; FIG. 4, NOTOPODIAL SETA $\times 170$.

larger while the dorsal cirri have a similar form and are about as large as the median tentacle. All tentacles and cirri are colorless at the apex, an appearance which in some is heightened by a sub-apical pigment band. The contrast between the pigment band and the colorless apex sometimes makes them look as if the apex were slightly swollen, but this is evidently merely an optical effect. Except for this colorless apex, the cirri around the prostomium and the palps show traces of a brown color. A similar color appears on

the dorsal cirri, and a poorly defined band of brown pigment extends along the mid-dorsal line of the body broken only by a prominent white patch in each somite near the dorsal anterior margin. This coloration is more sharply marked toward the posterior end of the fragment. On the dorsal surface of somites which do not carry cirrophores is a rounded lobe lying in line with the cirrophores of other somites (fig. 2) and toward the posterior part of the specimen these knobs show the same brown color.

The protruded proboscis is about twice as long as the palps and has at the apex, above and below, nine prominent conical marginal lobes.

Most of the elytra are lost, but they evidently did not cover the dorsal surface when in place. They are roughly circular in outline, are more or less mottled with brown and under low power, because of the distribution of this pigment, look as if the margins were thicker than the center. This is apparently merely an effect produced by the pigment. The elytron is thickly studded over its surface with short sharp conical spines which extend to the margins and sometimes protrude beyond this.

The neuropodium (fig. 2), has an obliquely truncated setal lobe, with the upper outer angle prolonged into a conical "tongue" into which the apex of the acicula extends. Aside from this terminal protrusion the neuropodium is cylindrical, showing no narrowing up to the point where the truncation begins. The neural setae are smaller than the notal and are golden yellow in color. Each has (fig. 3) transversely arranged plates whose free margins are denticulated. These plates are longer than the width of the seta so that seen in full face they extend on both sides of the shaft. In profile they have the appearance shown in the figure. The notopodial lobe of the parapodium is rounded in form and is shorter than the neuropodial but has a similar apical "tongue" into which the acicula extends. The notopodial setae are chestnut-brown in color and are larger than the neuropodial. Each seta (fig. 4) has transverse rows of spines the row nearest the apex being the shortest and from here there is a gradual increase in length so that the longest are more than half as long as the diameter of the seta.

Type.—Cat. No. 19101, U.S.N.M.

BENJAMINITE, A NEW SULPHOSALT MINERAL OF THE KLAPROTHOLITE GROUP.

By EARL V. SHANNON,

Assistant Curator, Department of Geology, United States National Museum.

INTRODUCTION.

The present description pertains to a mineral from near Round Mountain, Nye County, Nev., which occurs in a quartz vein with molybdenite, mica, and minor amounts of other minerals. Upon analysis this has been found to be an argentiferous sulphobismuthite of lead and copper differing in ratios from any known mineral. For this new mineral the name proposed is benjaminite, in honor of Dr. Marcus Benjamin of the United States National Museum.

The specimens first examined were sent to the United States Geological Survey some years ago, where they were incorporated in a series of bismuth ores by Frank L. Hess and forwarded to the National Museum. It was not known who sent them in and the only information regarding them was contained in a label reading "Aikinite Mining Co., Round Mountain, Nevada." It was concluded from the name of the mining company that the mineral had been identified as aikinite and that it was a characteristic mineral of the deposit. Nothing further could be learned about the mineral or the mine, however, until an inquiry was addressed to H. G. Clinton, of Manhattan, Nev. Fortunately Mr. Clinton was familiar with the mine, its geology, history, and mineralogy, and was able to visit the locality and to supply an additional very fine specimen of the benjaminite, especially welcome since the original small lot had been almost entirely used up in the several analyses, as well as specimens of the associated minerals. It developed from this correspondence that the material originally received at the Geological Survey had also come from Mr. Clinton. The writer takes this opportunity to acknowledge his obligation to Mr. Clinton for his generosity and his thorough knowledge of the region. The following is quoted from his letter:

The Aikinite Mining Co. has been out of existence for years but they were operating the Outlaw Mine some 12 miles north of here [Manhattan] at the head of Mariposa Canyon.

The mineral [benjaminite] occurs in large and small bunches and blotches in a dense white quartz, near the southern contact of a rock locally called pegmatite, but described by J. M. Hill as a soda-granite, and an intrusive rhyolite. I have

had assays of 300 ounces in silver from the mineral. I have also noted large flakes of molybdenite associated with it, but all that was ever mined has been carried away.

I note that you have only a few fragments of the mineral left so I am sending my specimen, which is the finest I have yet seen. I hope to get more. I am sending also all the other minerals associated with it, including three or four colors of material that leach out of the ledge, also a small piece of the soda granite. Close to this Outlaw tunnel is a deposit of cinnabar with values in free gold.

Three miles east on the same contact is another bismuth-silver deposit, the bismuth here being in the form of carbonate. Three miles west is a deposit of the molybdenite like the sample sent.

ASSOCIATED MINERALS.

The minerals occurring in the specimens with the benjaminite are quartz, chalcopyrite, pyrite, covellite, muscovite, molybdenite, and fluorite.

The quartz is coarsely crystalline white vein quartz which forms the gangue of the other minerals. As seen in thin section under the

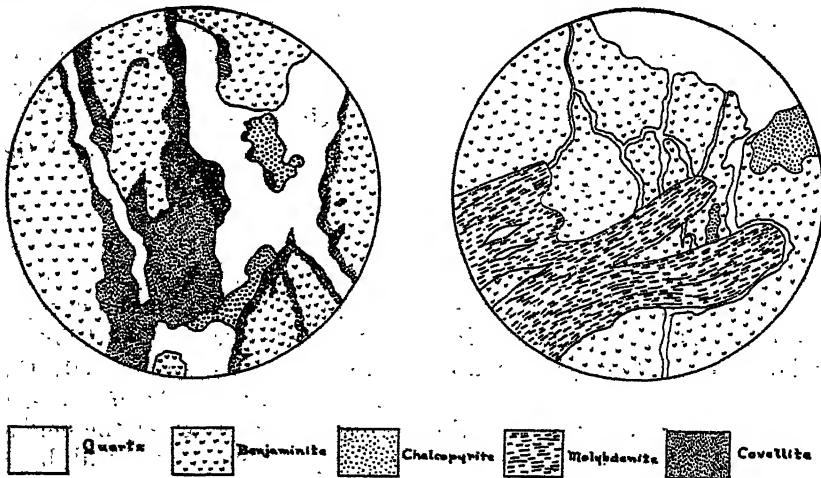


FIG. 1.—SKETCH OF POLISHED SURFACE OF BENJAMINITE SHOWING RELATION OF BENJAMINITE TO QUARTZ AND CHALCOPYRITE AND REPLACEMENT OF CHALCOPYRITE AND BENJAMINITE BY COVELLITE.

FIG. 2.—SKETCH OF POLISHED SURFACE SHOWING RELATIONS OF BENJAMINITE, MOLYBDENITE, CHALCOPYRITE, AND QUARTZ.

microscope it forms broad interlocking crystals which contain numerous fluid inclusions which are visible with the higher powers of the microscope. Some of the largest of these contain bubbles and the smaller are aligned into strings. A later introduction of quartz took place filling numerous very fine fractures in the older quartz, and especially in the sulphides. These later quartz seams are especially conspicuous in polished surfaces of the sulphides under the microscope and are indicated in the drawing (fig. 2).

Muscovite is common in the quartz as scales and aggregates of scales. The individual crystals range up to 1 cm. in diameter and are in part hexagonal in outline. In color the mica varies from pale

green to white or pale brown and much of it has a more or less pearly luster. It is probably all of the margarodite variety of muscovite, low in potash and correspondingly high in basic hydrogen. Optically it is negative with the acute bisectrix perpendicular to the plates, $2E$ estimated at 60° to 70° , $\alpha = 1.562$, $\beta = 1.597$, $\gamma = 1.602$, $r > v$ weak. Other specimens from the mine consist entirely of masses of scales of mica, some of which contain scattered crystals of fluorite and rare masses of benjaminite.

Pyrite occurs as cubic crystals which are rare in intimate association with the benjaminite. Other quartz specimens which contain no benjaminite show cubic crystals up to 3 cm. in diameter isolated in the quartz which also contains mica. The pyrite crystals are greatly shattered and show distinct cubic cleavage.

Molybdenite occurs as a graphitic slickensided smear on fractures and also as foliated scales and small rosettes of scales. It is occasionally interleaved with mica. Some of the rosettes reach a diameter of 5 mm. Occasionally these have a sharp hexagonal outline and are made up of six triangular sectors with a twinning line down the center and striation on either side like the A structure of mica. As seen in polished sections the molybdenite is older than the benjaminite and its folia have been contorted, separated, and bent by the later fractures, although the cracks do not cross the folia but pass around their ends. The relations of the molybdenite to the other minerals are shown in the drawings (figs. 2 and 3).

Fluorite occurs especially as isolated crystals in the granular masses of mica where it forms crystals up to 4 cm. in maximum size. The color varies from deep purple to purplish red, yellow and colorless. In the mica fluorite occurred in the same specimen with benjaminite but only one specimen shows fluorite in quartz and this does not contain any benjaminite. The fluorite forms a skeleton cube apparently developing by metasomatic replacement of the quartz.

Chalcopyrite occurs only as minute, almost microscopic, grains and was introduced with the late quartz which fills fine cracks in

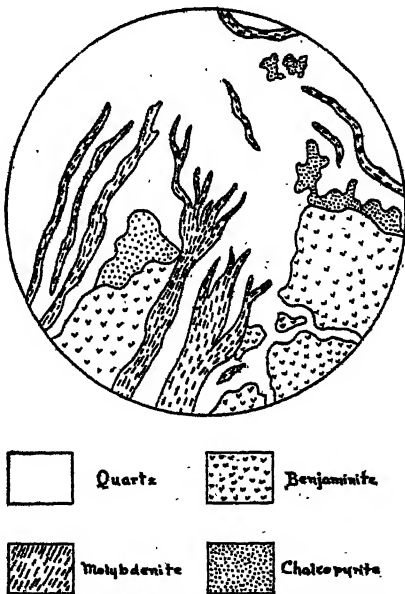


FIG 3.—SKETCH OF POLISHED SURFACE SHOWING RELATIONS OF BENJAMINITE, MOLYBDENITE, CHALCOPYRITE AND QUARTZ.

the benjaminite. It forms grains isolated in the quartz and small areas grown on the benjaminite or apparently, in some cases, replacing the benjaminite. This mineral is mainly clearly later than the benjaminite although a very little may be contemporaneous with it. The relations of the chalcopyrite are shown in figures 1, 2, and 3.

Covellite occurs in minute amount as a later replacement, along cracks, of both chalcopyrite and benjaminite, preferring the latter. The field showing the greatest amount of this mineral is that shown in Figure 1. The amount of covellite present in the analyzed material was so exceedingly small that it could not have any effect on the analytic results.

Chalcocite was seen as a few rare and very minute areas replacing covellite.

PARAGENESIS.

The minerals may be arranged in the following paragenetic order although there is some doubt as to the mutual age relations of some of the earlier ones.

1. Quartz.
2. Muscovite.
3. Molybdenite.
4. Pyrite.
5. Fluorite.
6. Benjaminite.
7. Quartz.
8. Chalcopyrite.
9. Covellite.
10. Chalcocite.

While a considerable time gap may have intervened between the first five and the second five of these minerals it is most probable that the whole series belongs to a single genetic sequence although the covellite and chalcocite may be products of downward secondary enrichment. The benjaminite, a silver-bismuth ore mineral, is thus a constituent of a vein characterized by mica, molybdenite, and fluorite, minerals typical of high temperature veins of pegmatitic affiliations. Such a silver deposit is more or less unique.

GENERAL DESCRIPTION OF BENJAMINITE.

The benjaminite is the only abundant metallic mineral in the ore and carries the silver for which the mine was explored. It forms irregular masses up to 5 cm. in maximum diameter which have clearly developed along fractures in the quartz, apparently by replacement. The benjaminite contains some pyrite although many masses are free from it and it all contains fine grains of chalcopyrite developed along later minute quartz filled cracks. The color on fresh fracture

is medium gray and the luster is metallic with a greasy appearance. At first glance the mineral suggests massive tetrahedrite. It has a moderately good cleavage in one direction, somewhat interrupted by the later cracks. The masses are coarse equigranular and the mineral shows no tendency to platy, fibrous or prismatic form. Cleavage surfaces indicate the crystals to reach a maximum size of 15 mm. in the masses. Upon exposure the cleavage surface remains bright or becomes slightly yellow while in another direction the grains tarnish coppery red and in a third direction they become dull lead gray. Granular aggregates which have been exposed for some time look like a mixture of three minerals and the nondescript appearance is heightened by the quartz filled cracks, minute chalcopyrite grains and scattered pyrite and molybdenite. The streak is dull lead gray and only assumes a barely perceptible reddish gray tinge with long rubbing. The mineral scratches calcite but with difficulty and its hardness is thus about 3.3 to 3.5.

PYROGNOSTICS, ETC.

Benjaminite is soluble in hot concentrated nitric or hydrochloric acid and the solution gives the usual qualitative reactions for silver, copper, bismuth, and lead. Alone on charcoal it yields sulphurous fumes but is not reduced. With potassium iodide-sulphur mixture the usual conspicuous bismuth coating is obtained. In the closed tube it gives only a ring of sulphur and in the open tube only sulphur dioxide without the formation of any sublimate.

MICROSCOPIC PROPERTIES.

In polished sections under the metallographic microscope the benjaminite is medium gray, the color being about that of the average tetrahedrite. Examined with polarizing reflecting apparatus the mineral is found to be uniformly and very decidedly anisotropic but it exhibits no color pleochroism. When the surface is treated with the standard microchemical reagents hydrochloric acid, ferric chloride, mercuric chloride, and potassium hydroxide give negative results. With reagent nitric acid the surface effervesces and blackens and the fumes tarnish brown. These properties, according to Davy and Farnham's scheme, would identify the mineral as aikinite, thus seemingly substantiating the qualitative identification.

ANALYSES AND COMPOSITION.

The specimens were at first labeled aikinite and the mineral not only gives the qualitative reactions of aikinite but greatly resembles the aikinite from Beresov, Siberia in the Museum collections. The analysis was at first undertaken as of aikinite from a new locality and was temporarily discontinued owing to the inhomogeneous

appearance of the material. A specimen was then polished and examined carefully by modern metallographic methods and, avoiding molybdenite and the scattered large grains of pyrite, was found to be homogeneous except for the small percentage of chalcopyrite. Four analyses were made in all on separate specimens, each of which was carefully selected and studied metallographically. In analysis 1 the presence of silver was not suspected and it was weighed with the copper. In analysis 2, made a year later, a large error was made by inadvertently filtering off a large part of the lead and weighing it in the form of sulphate, with the quartz. The value for lead in this analysis was adopted arbitrarily from the mean relation of lead to bismuth in the other three and the insoluble matter and sulphur were corrected in accordance. The results are given here because the determinations of copper, silver, and bismuth are of value. The analyses were made at intervals over three years and with variously modified procedures. Each analyzed sample was a thin slice which had been polished and examined metallographically and selected free from pyrite and with a minimum of molybdenite. These were crushed and screened to pass 100-mesh screens, the dust removed, and the quartz floated out by a gravity separation with methylene iodide. The quartz present in exceedingly thin veinlets yielded mixed grains so that the samples could not be entirely freed from quartz. The small chalcopyrite grains associated with the quartz could not be avoided although in one case they were largely removed magnetically. The results of the analyses are stated in detail, separately, below.

Analysis 1 of benjaminite.

Constituent.	Original.	Deductions.	Net.	Recalculated.
Quartz-----	13.46	13.46		
Lead-----	20.77		20.77	26.87
Copper-----	8.17	1.92	6.25	8.09
Silver-----				
Iron-----	1.69	1.69		
Bismuth-----	38.36		38.36	49.63
Molybdenum-----	.60	.60		
Sulphur-----	14.26	2.35	11.91	15.41
Total-----	97.31	20.02	77.29	100.00

The impurities deducted are the insoluble quartz and molybdenite equivalent to the total molybdenum and chalcopyrite equivalent to the total iron. These amount to quartz 13.46 per cent, molybdenite 1 per cent, and chalcopyrite 5.56 per cent.

The results of analysis 2, recalculated as above noted, are as follows:

Analysis 2 of benjaminite (recalculated).

Constituent.	Original.	Deductions.	Net.	Recalculated.
Quartz-----	12. 83	12. 83	-----	-----
Lead-----	18. 53	-----	18. 53	23. 95
Copper-----	4. 07	1. 85	2. 22	2. 87
Silver-----	3. 24	-----	3. 24	4. 19
Iron-----	1. 63	1. 63	-----	-----
Bismuth-----	41. 64	-----	41. 64	53. 83
Molybdenum-----	. 46	. 46	-----	-----
Sulphur-----	13. 92	2. 19	11. 73	15. 16
Total-----	96. 32	18. 96	77. 36	100. 00

The deducted impurities are quartz 12.83 per cent, molybdenite 0.77 per cent and chalcopyrite 5.36 per cent.

Analysis 3 is the most dependable analysis of the four since the material was not only well selected but the method most suited for the several separations had been determined by the previous work. The powder used for analysis was, moreover, treated to a magnetic separation whereby a large part and possibly all of the chalcopyrite was removed. Although the iron found is considered below to be present as admixed chalcopyrite which is deducted, it is possible that the amount found in this analysis is essential to the benjaminite occurring as an isomorphous replacement of the lead. This would not affect the formula below derived but would rather tend to support it by bringing the analytical results into closer agreement with the calculated percentages. The analysis is as follows:

Analysis 3 of benjaminite.

Constituent.	Original.	Deductions.	Net.	Recalculated.
Quartz-----	8. 86	8. 86	-----	-----
Lead-----	21. 70	-----	21. 70	25. 25
Copper-----	6. 65	. 65	6. 00	6. 98
Silver-----	2. 78	-----	2. 78	3. 23
Iron-----	. 58	. 58	-----	-----
Bismuth-----	41. 45	-----	41. 45	48. 24
Molybdenum-----	1. 30	1. 30	-----	-----
Sulphur-----	15. 53	1. 53	14. 00	16. 30
Total-----	98. 85	12. 92	85. 93	100. 00

The deductions amount to quartz 8.86 per cent, molybdenite 2.17 per cent and chalcopyrite 1.91 per cent.

The fourth analysis, made as a final check on the preceding three was on a powder from which the chalcopyrite had not been removed magnetically. It gave the following results:

Analysis 4 of benjaminite.

Constituent.	Original.	Deductions.	Net.	Recalculated.
Quartz-----	10. 00	10. 00		
Lead-----	19. 98		19. 98	24. 70
Copper-----	5. 00	1. 59	3. 41	4. 22
Silver-----	2. 52		2. 52	3. 11
Iron-----	1. 40	1. 40		
Bismuth-----	41. 62		41. 62	51. 45
Molybdenum-----	1. 34	1. 34		
Sulphur-----	(15. 87)	2. 51	13. 36	16. 52
Total-----	97. 73	16. 84	80. 89	100. 00

The recalculated percentages for the several analyses of the benjaminite are collected and averaged in the following table:

Average and comparison of recalculated analyses.

Constituent.	1	2	3	4	Average.
Lead-----	26. 87	23. 95	25. 25	24. 70	25. 18
Copper-----	8. 09	2. 87	6. 98	4. 22	4. 69
Silver-----		4. 19	3. 23	3. 11	3. 51
Bismuth-----	49. 63	53. 83	48. 24	51. 45	50. 78
Sulphur-----	15. 41	15. 16	16. 30	16. 52	15. 84
Total-----	100. 00	100. 00	100. 00	100. 00	100. 00

The average column from the above table gives the ratios of the following table:

Ratios of average analyses.

Constituent.	Per cent.	Ratios.
Lead-----	25. 18	0. 122 0. 061×2 1. 04×2
Copper-----	4. 69	. 074} . 053×2 . 90×2
Silver-----	3. 51	. 032}
Bismuth-----	50. 78	. 250 . 062×4 1. 05×4
Sulphur-----	15. 84	. 494 . 055×9 . 93×9
Total-----	100. 00	

The above ratios indicate the formula for the mineral to be $Pb_2(Ag, Cu)_2Bi_4S_9$ or $2PbS.(Cu, Ag)_2S.2Bi_2S_3$. The average of the analyses is below repeated in comparison with the theoretical percentages and with several related minerals.

Comparison of benjaminite with other minerals.

Constituent.	Analysis.	Theory.	Aikinite.	Cosalite.	Galenobismutite.
Lead.....	25. 18	24. 50	36. 0	41. 8	27. 5
Copper.....	4. 69	5. 01	11. 0	-----	-----
Silver.....	3. 51	4. 25	-----	-----	-----
Bismuth.....	50. 78	49. 18	36. 2	42. 0	55. 4
Sulphur.....	15. 84	17. 06	16. 8	16. 2	17. 1
Total.....	100. 00	100. 00	100. 00	100. 00	100. 0

The low summation of the benjaminite analyses deserves comment as do the low sulphur determinations. In each analysis a single small portion only of the powdered and purified mineral was available. Sulphur had to be determined in an aliquot small portion of the solution used for general analysis, a procedure which tends to give low results both from loss of some sulphur on solution in acid, probably as hydrogen sulphide, and by incomplete precipitation by barium chloride. The results for this constituent are consequently only approximate and may be 1 per cent low in each case.

The low summation is in part due to this cause and in part to hygroscopic or absorbed substances in the fine powder, particularly methylene iodide used for the gravity separation which seems to adhere to the surfaces of the grains. The absence of zinc, manganese, tin, antimony, arsenic, and other probable metals was definitely determined.

The mineral seems unquestionably distinct from any established species. The nearest approach to the composition found in the literature is in certain cupriferous and argentiferous cosalites quoted in Dana. Cosalite is a lead mineral, the composition of which is definitely established and, while the lead is probably susceptible of replacement by metals of like valence, including cupric copper, cupric sulphide is relatively rare as a constituent of the sulpho-salt minerals and the copper commonly occurs in the cuprous form isomorphous with silver. The non-isomorphism of metals of unlike valence in minerals of this class is now widely recognized¹ and these analyses of "cosalite" which show amounts of silver and copper in excess of 1 or 2 per cent are doubtless other minerals or mechanical mixtures and required to be reexamined by modern methods.

The benjaminite falls in the 3:2 division, klaprotholite group of Wherry and Foshag.² The members of this group now are as follows:

Klaprotholite.....	3Cu ₂ S	2Bi ₂ S ₃
Schirmerite.....	2Ag ₂ S. PbS	2Bi ₂ S ₃
Rathite.....	3PbS	2As ₂ S ₃
Benjaminite.....	2PbS. (Cu, Ag) ₂ S	2Bi ₂ S ₃

¹ William F. Foshag. The isomorphic relations of the sulphosalts of lead, silver and copper. *Amer. Journ. Sci.*, vol. 1, pp. 444-446, 1921.

² Edgar T. Wherry and William F. Foshag. A new classification of the sulfo-salt minerals. *Journ. Wash. Acad. Sci.*, vol. 11, pp. 1-8, 1921.

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